Introduction to Subversion: a Version Control System

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About Homework #4

- Goal: Learn how to use a version control system to maintain software projects.
- Detail:
  - You should study the concept of version control system, and its server-client model.
  - A hands-on test will be used to test your knowledge of using **Subversion** to manipulate different versions of a Visual Studio project workspace.

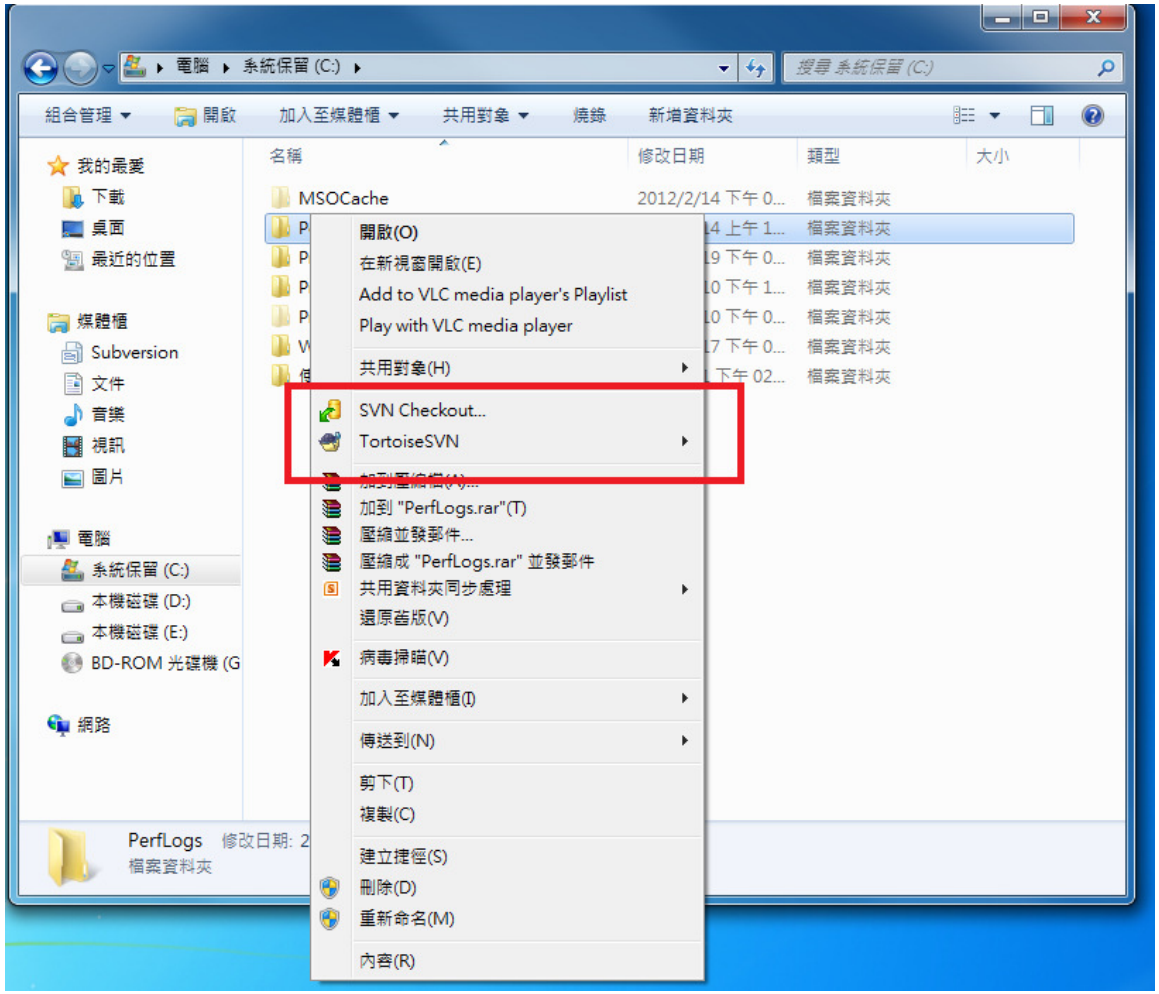
What is Subversion?

- A free open-source version control system.
- Manage files and directories, and the changes made to them, over time.
- Home Page: http://subversion.tigris.org
- The original subversion project does not provide GUI.

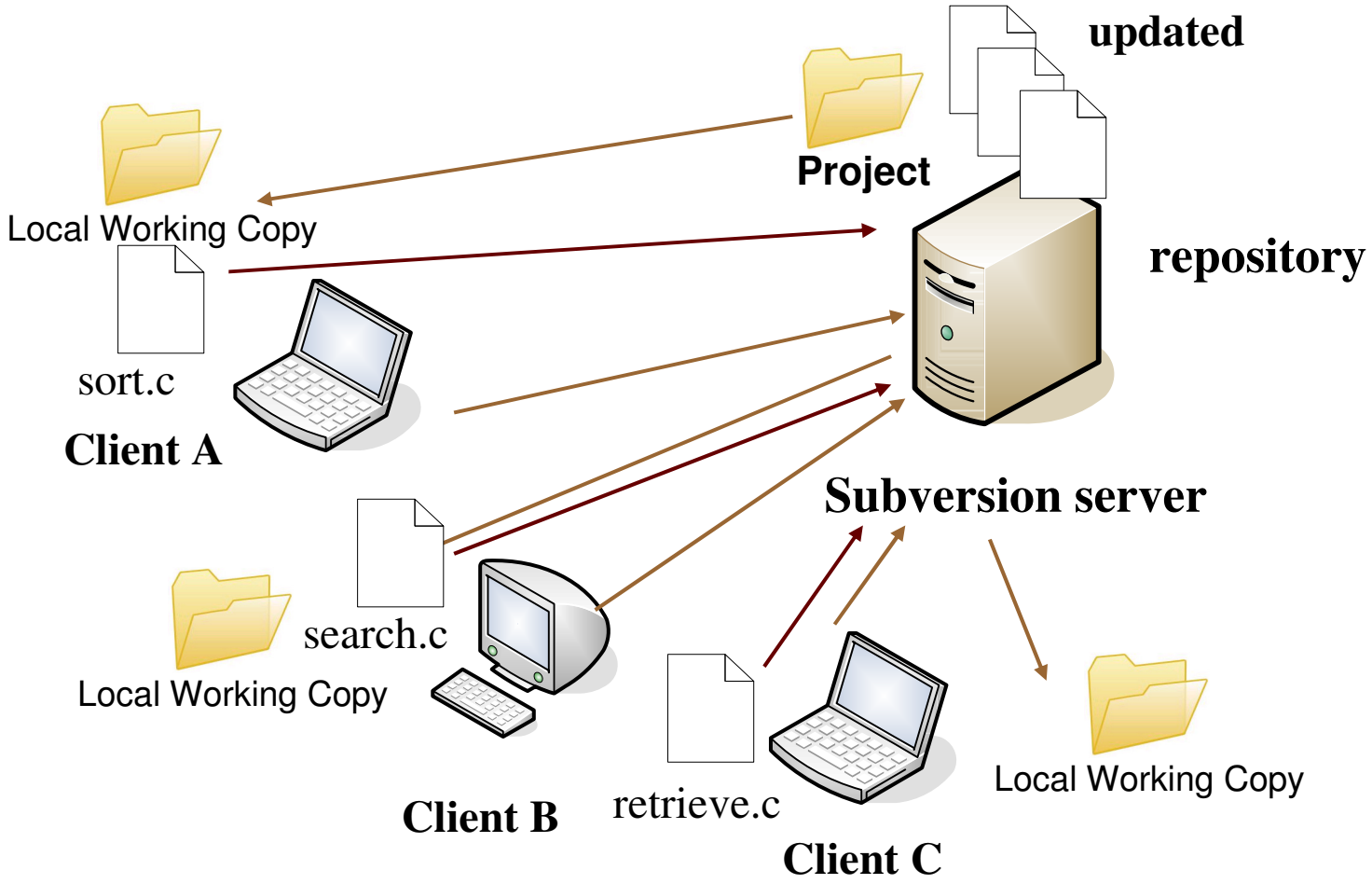
TortoiseSVN(1/2)

- A Windows GUI version of Subversion.
- We will use TortoiseSVN in the fllowing.
- Download and install TortoiseSVN at http://tortoisesvn.tigris.org
- If successfully installed, right-click anywhere in the explorer will show the svn options.

TortoiseSVN(2/2)



Subversion System Architecture



Subversion's Features

- Directory versioning
  - Track changes to the whole directory trees over time.
- True version history
  - Add, delete, copy, and rename both files and directories.
- Atomic commits
  - A collection of modifications either goes into the repository completely, or not at all.
- Versioned metadata
  - Each file and directory has a set of properties—keys and values associated with it.
- Consistent data handling
  - Identically for both text and binary files.

The Problem of File-Sharing

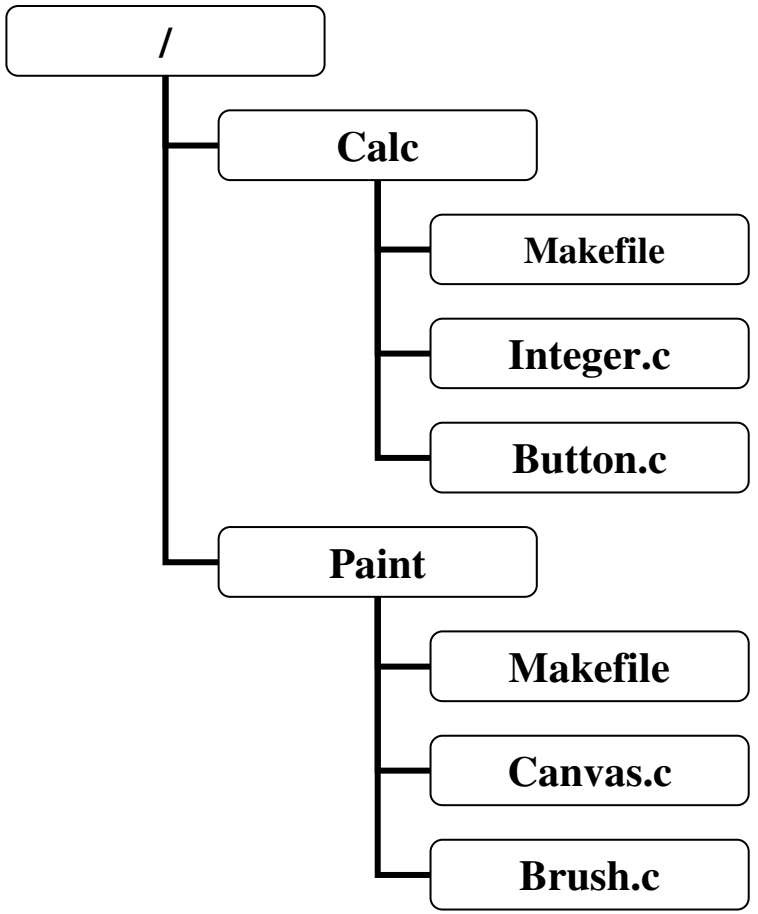
- The Lock-Modify-Unlock Solution
  - Only one person changes a file at a time.
  - Administrative problems.
  - Unnecessary serialization.
  - A false sense of security.
- The Copy-Modify-Merge Solution (Subversion)
  - Each user's client contacts the project repository and creates a personal working copy.
  - Users then work simultaneously and independently, modifying their private copies.
  - Finally, the private copies are merged into a new, final version.

Fundamental Concepts of Subversion

- The Repository
- Working Copies
- Revisions

The Repository

- A central store of data.
- Store information in the form of a filesystem tree—a typical hierarchy of files and directories.
- Remember every change ever written to it.
- Track changes to data over time.



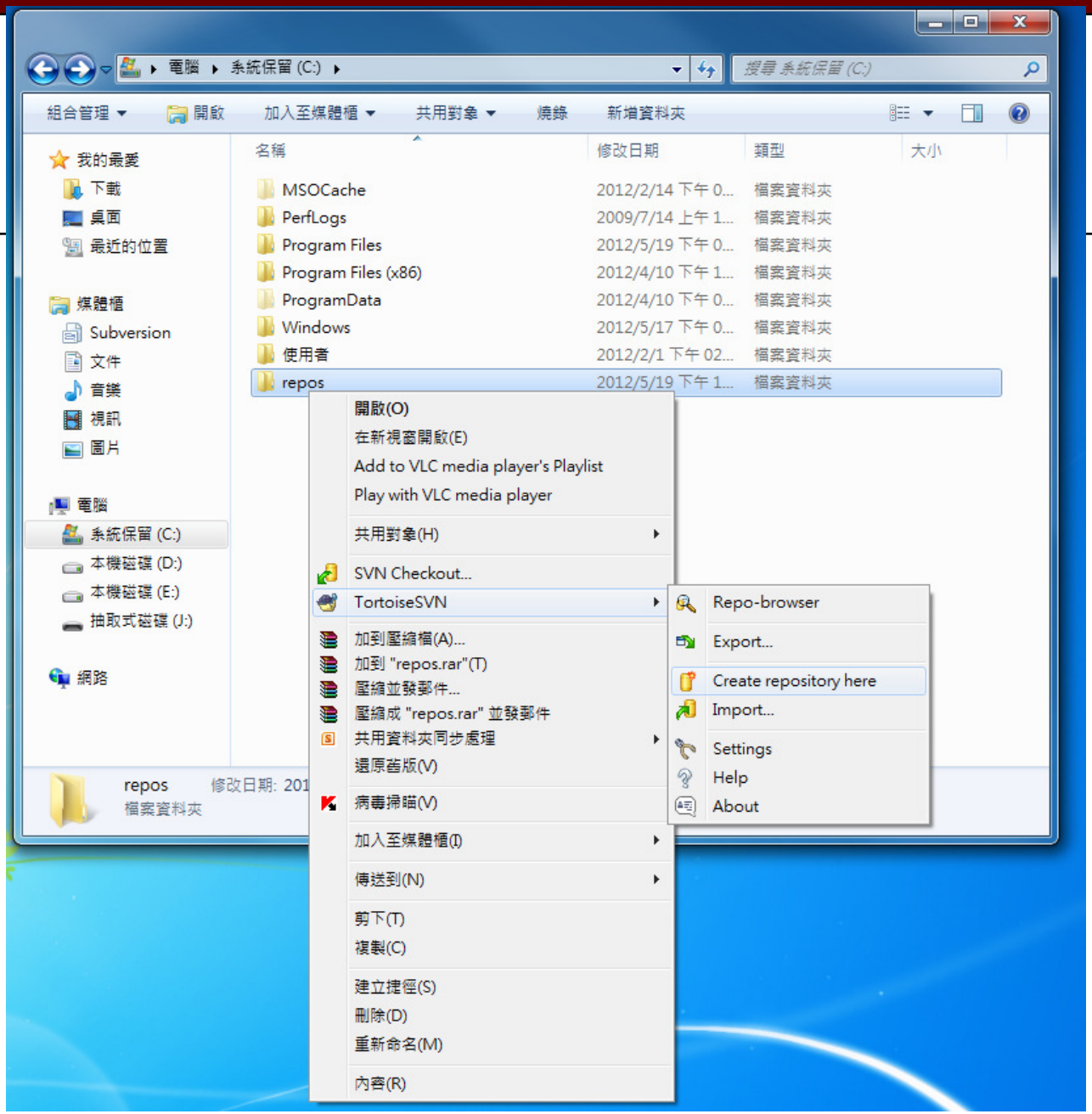
Repository: Basics

- Subversion uses URLs to identify versioned files and directories in Subversion repositories.
- “One repository, one project” or “one repository, multiple projects”
- Please refer to Chapter 6 of the book “Version Control with Subversion” for understanding of advanced Subversion server options†.
- To practice, we use local directory to create a repository in the following.

† http://svnbook.red-bean.com/index.en.html

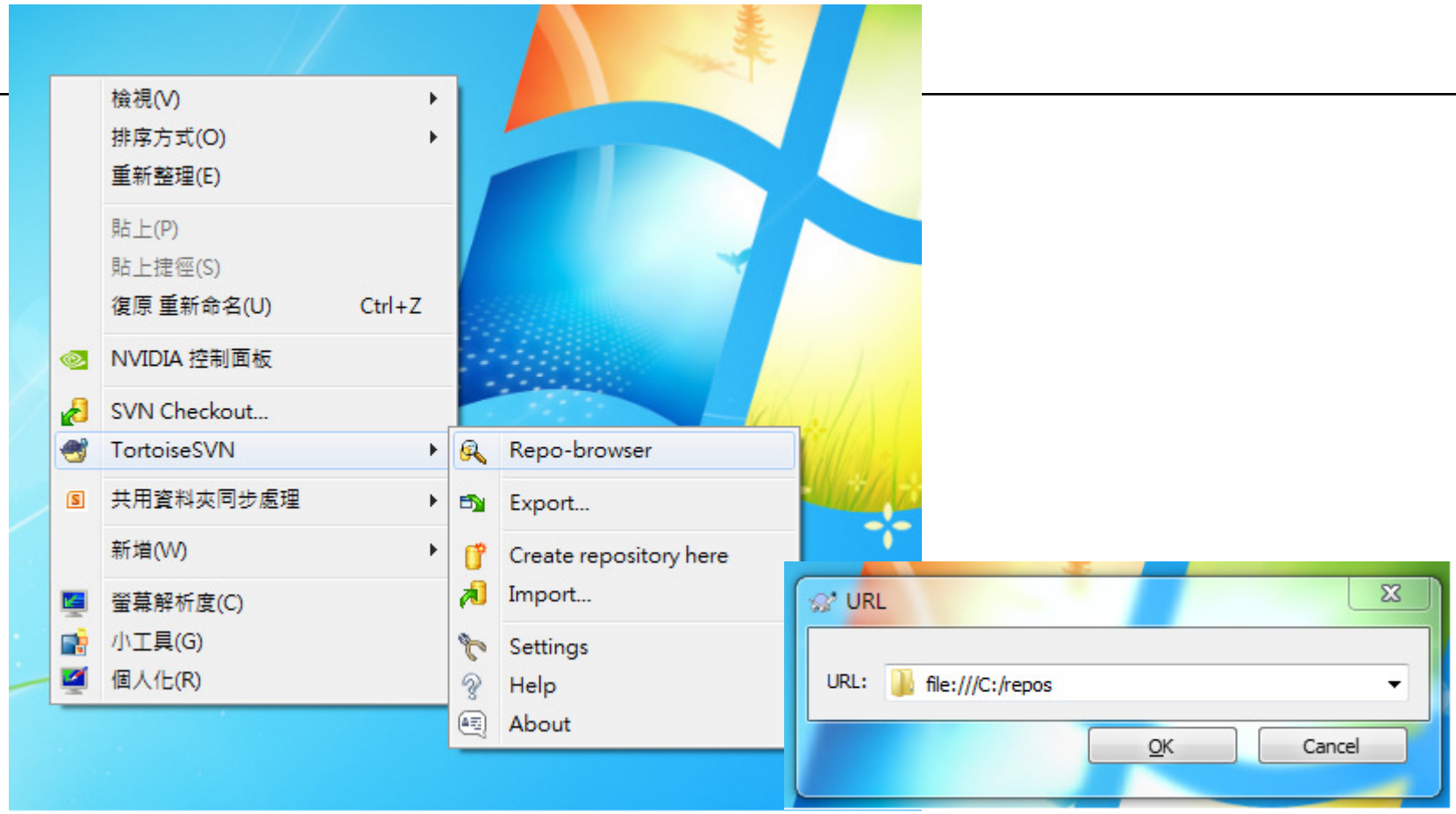
Repository: Create

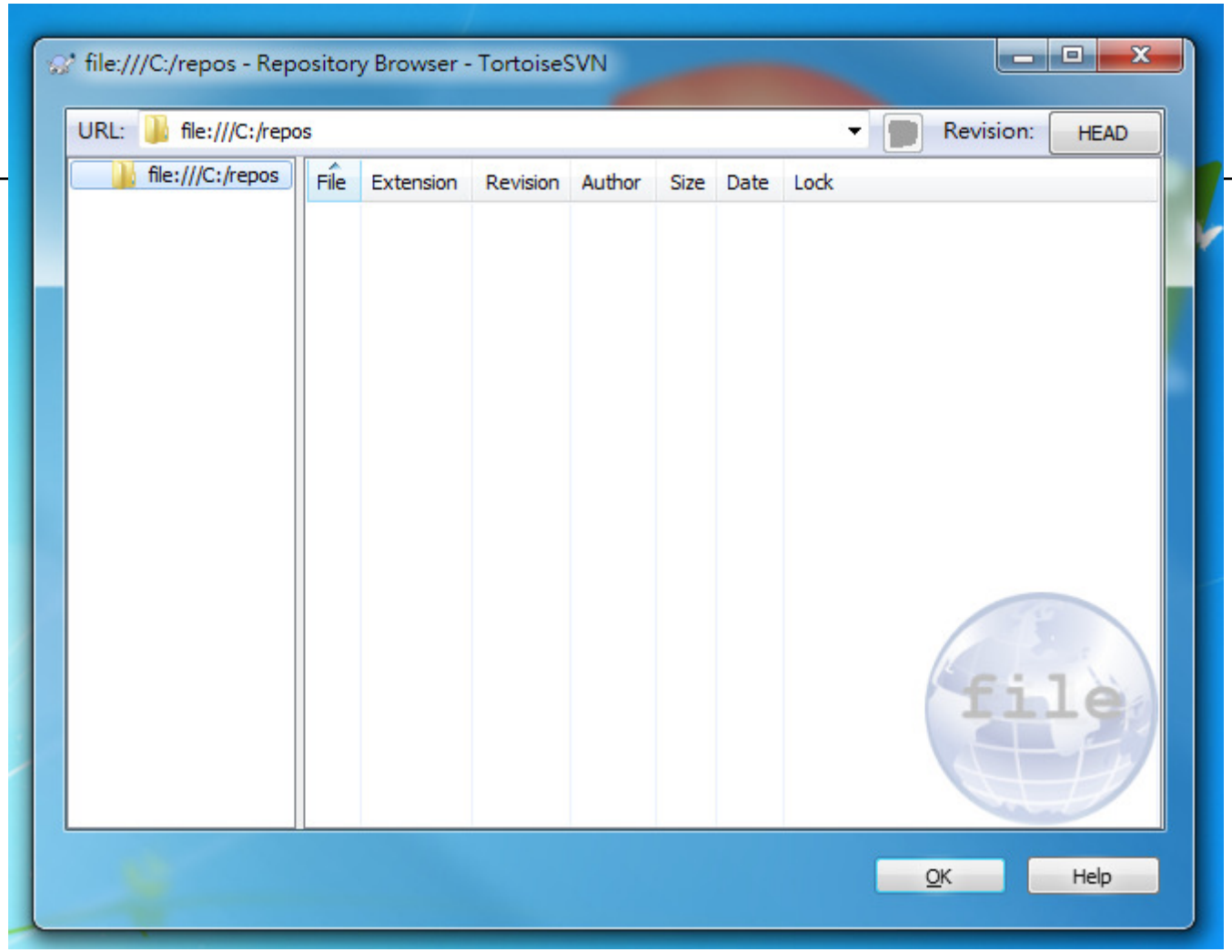
- To create a new repository, we first create a new directory. eg. C:\repos
- Right-click the new directory C:\repos and press “Create repository here.”
- Now C:\repos is a new empty repository.


電腦 ▸ 系統保留 (C:) ▸
搜尋 系統保留 (C:)
組合管理
開啟
加入至媒體櫃
共用對象
燒錄
新增資料夾
我的最愛
下載
桌面
最近的位置
媒體櫃
Subversion
文件
音樂
視訊
圖片
電腦
系統保留 (C:)
本機磁碟 (D:)
本機磁碟 (E:)
抽取式磁碟 (J:)
網路
名稱
修改日期
類型
大小
MSOCache 2012/2/14 下午 0... 檔案資料夾
PerfLogs 2009/7/14 上午 1... 檔案資料夾
Program Files 2012/5/19 下午 0... 檔案資料夾
Program Files (x86) 2012/4/10 下午 1... 檔案資料夾
ProgramData 2012/4/10 下午 0... 檔案資料夾
Windows 2012/5/17 下午 0... 檔案資料夾
使用者 2012/2/1 下午 02... 檔案資料夾
repos 2012/5/19 下午 1... 檔案資料夾
開啟(O)
在新視窗開啟(E)
Add to VLC media player's Playlist
Play with VLC media player
共用對象(H)
SVN Checkout...
TortoiseSVN
加到壓縮檔(A)...
加到 "repos.rar"(T)
壓縮並發郵件...
壓縮成 "repos.rar" 並發郵件
共用資料夾同步處理
還原舊版(V)
病毒掃瞄(V)
加入至媒體櫃(I)
傳送到(N)
剪下(T)
複製(C)
建立捷徑(S)
刪除(D)
重新命名(M)
內容(R)
Repo-browser
Export...
Create repository here
Import...
Settings
Help
About
repos
檔案資料夾

Repository: Repository Browser

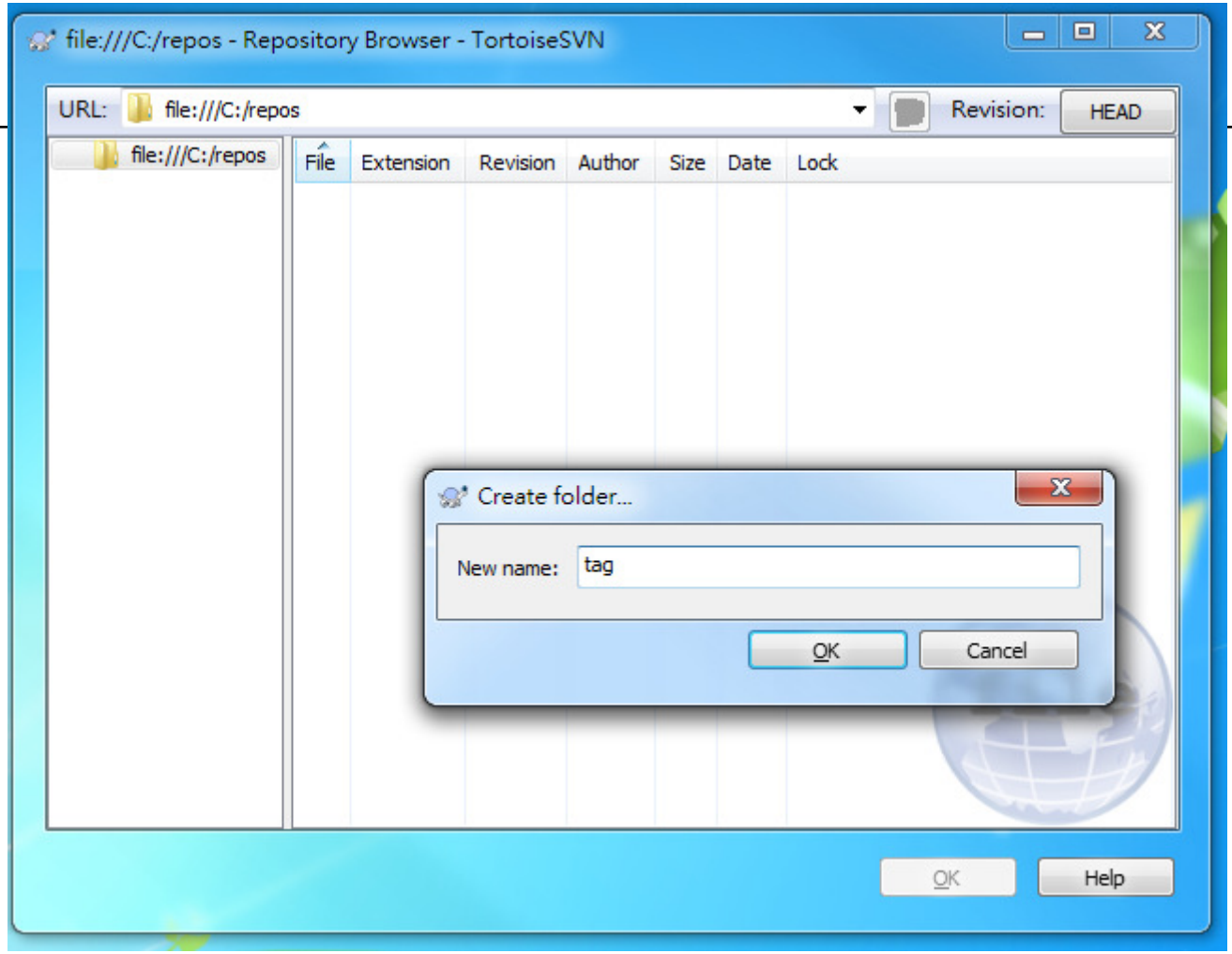
- We can use the repository browser provided by TortoiseSVN to browse all projects in a repository.
- To connect to a repository
  - Google svnserve server
    - *http*://nctu-20012-spring-ics.googlecode.com/svn/trunk/ nctu-20012-spring-ics-read-only
  - Local repositroy
    - file:///C:/repos

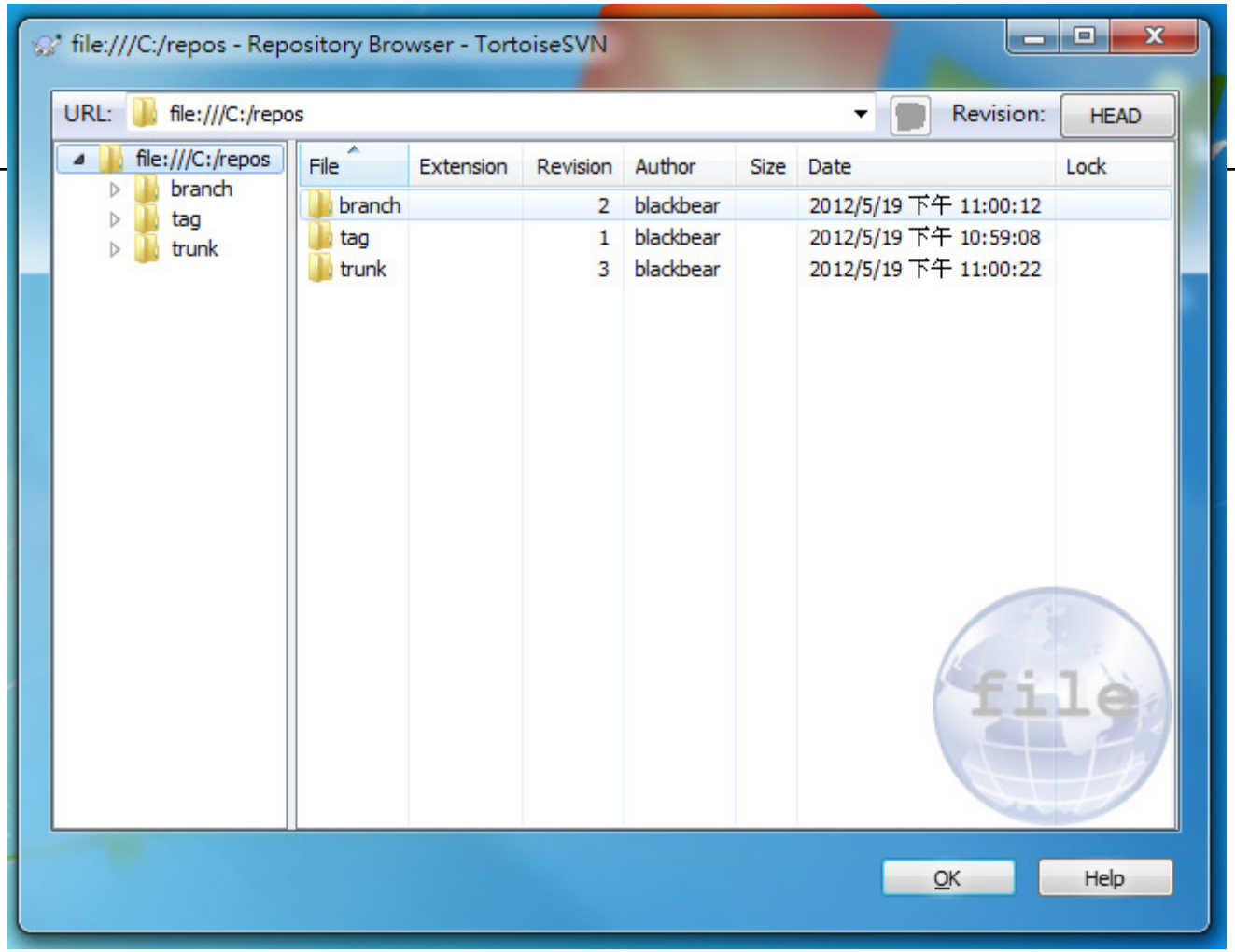

檢視(V)
排序方式(O)
重新整理(E)
貼上(P)
貼上捷徑(S)
復原 重新命名(U) Ctrl+Z
NVIDIA 控制面板
SVN Checkout...
TortoiseSVN
共用資料夾同步處理
新增(W)
螢幕解析度(C)
小工具(G)
個人化(R)
Repo-browser
Export...
Create repository here
Import...
Settings
Help
About
URL
URL:
file:///C:/repos
OK
Cancel


file:///C:/repos - Repository Browser - TortoiseSVN
URL:
file:///C:/repos
Revision:
HEAD
file:///C:/repos
File
Extension
Revision
Author
Size
Date
Lock
file
OK
Help

Repository: Create Folder

- As an example, we first create three folder in the repository.
  - Right-clicking the repository directory in the repository browser show all functions we need to create, add, delete, and import files.
  - We now create trunk, branch, and tag folders.
  - Note that “add folder” and “add file” adds existing files and folders into the repository. In other hand, “create folder” creates empty folder in the repository.

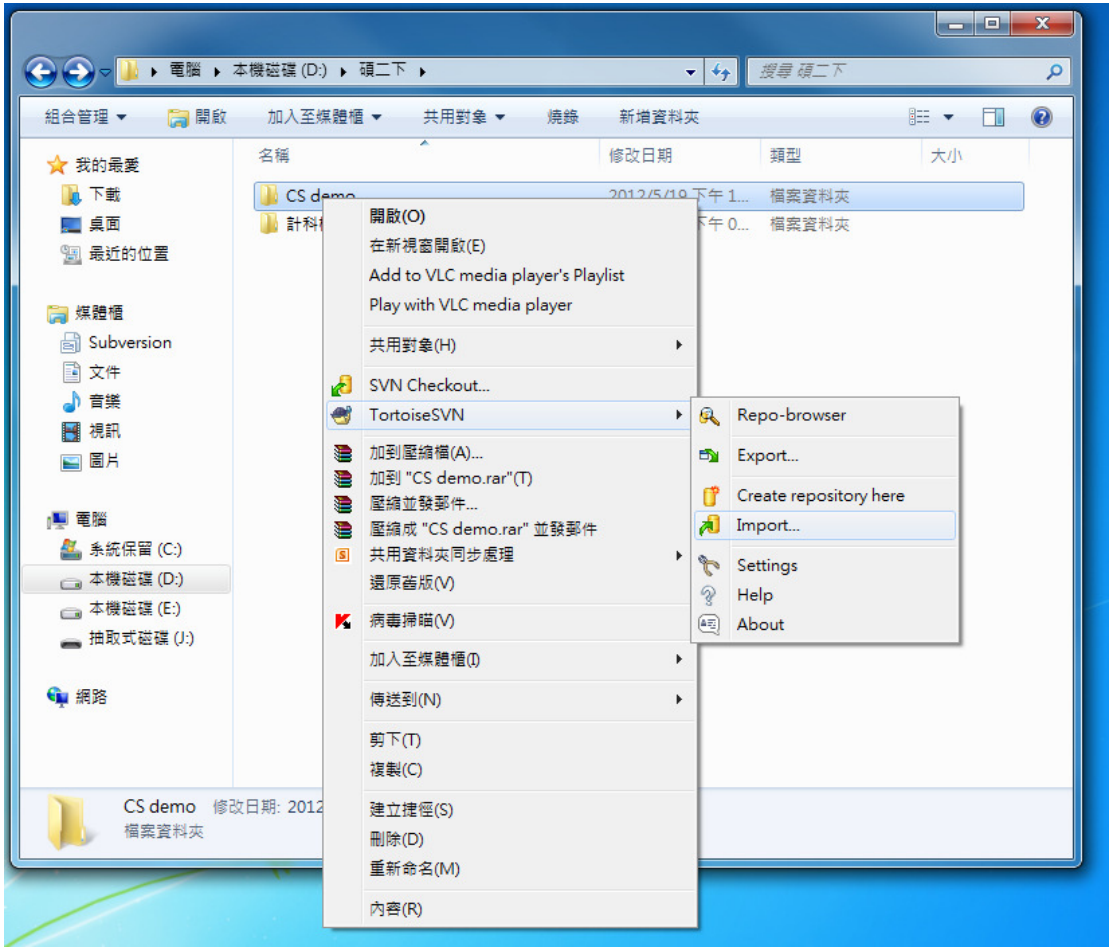

file:///C:/repos - Repository Browser - TortoiseSVN
URL:
file:///C:/repos
Revision:
HEAD
file:///C:/repos
File
Extension
Revision
Author
Size
Date
Lock
Create folder...
New name:
tag
OK
Cancel
OK
Help


file:///C:/repos - Repository Browser - TortoiseSVN
URL:
file:///C:/repos
Revision:
HEAD
file:///C:/repos
branch
tag
trunk
File
Extension
Revision
Author
Size
Date
Lock
branch
2
blackbear
2012/5/19 下午 11:00:12
tag
1
blackbear
2012/5/19 下午 10:59:08
trunk
3
blackbear
2012/5/19 下午 11:00:22
file
OK
Help

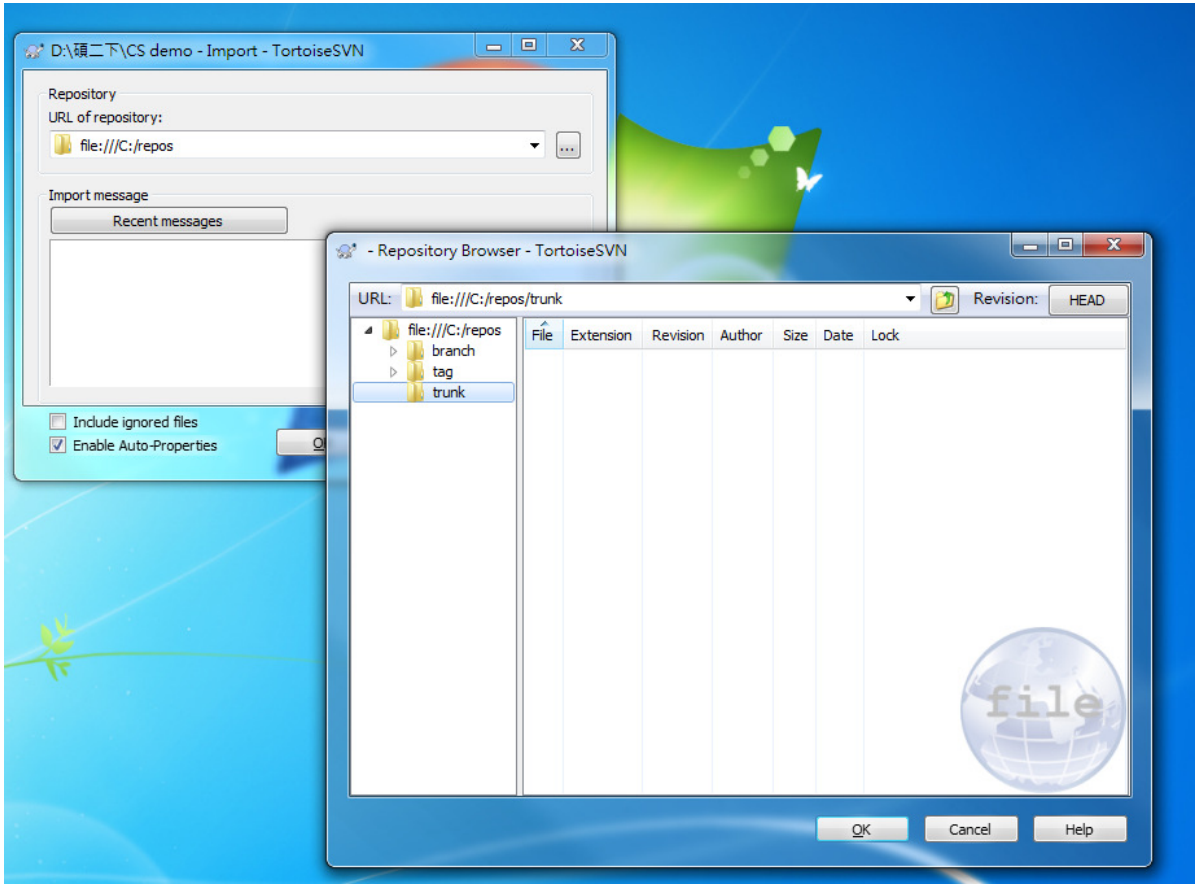
Repository: Import and Add

- Let's assume we have an existing project "CS demo" including some source codes, now we try to add this project into the repository and put it in the trunk folder. This can be done using either "import" or "add".
  - Import : copy an unversioned tree of files into a repository
    - Right-click the "CS demo" folder in your explorer and press import
    - Select the trunk folder by pressing the button "…"
    - Press "OK", the importing results will be shown when all operations are done.
  - Add file and add folder: add files, directories, or symbolic links
    - Open the repository browser.
    - Right-click the trunk folder and press "Add file" or "Add folder"
    - Select file or folder we want to import.

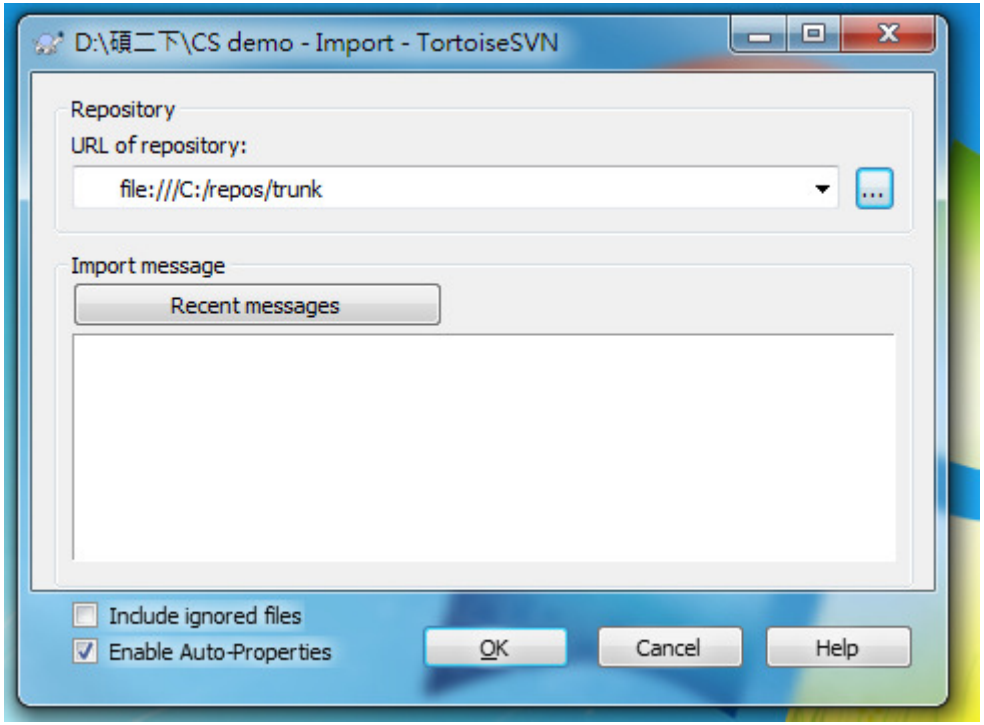
Import (1/4)


電腦 ▸ 本機磁碟 (D:) ▸ 碩二下 ▸
搜尋 碩二下
組合管理
開啟
加入至媒體櫃
共用對象
燒錄
新增資料夾
我的最愛
下載
桌面
最近的位置
媒體櫃
Subversion
文件
音樂
視訊
圖片
電腦
系統保留 (C:)
本機磁碟 (D:)
本機磁碟 (E:)
抽取式磁碟 (J:)
網路
名稱
修改日期
類型
大小
CS demo
檔案資料夾
開啟(O)
在新視窗開啟(E)
Add to VLC media player's Playlist
Play with VLC media player
共用對象(H)
SVN Checkout...
TortoiseSVN
加到壓縮檔(A)...
加到 "CS demo.rar"(T)
壓縮並發郵件...
壓縮成 "CS demo.rar" 並發郵件
共用資料夾同步處理
還原舊版(V)
病毒掃瞄(V)
加入至媒體櫃(I)
傳送到(N)
剪下(T)
複製(C)
建立捷徑(S)
刪除(D)
重新命名(M)
內容(R)
Repo-browser
Export...
Create repository here
Import...
Settings
Help
About
CS demo 修改日期: 2012
檔案資料夾

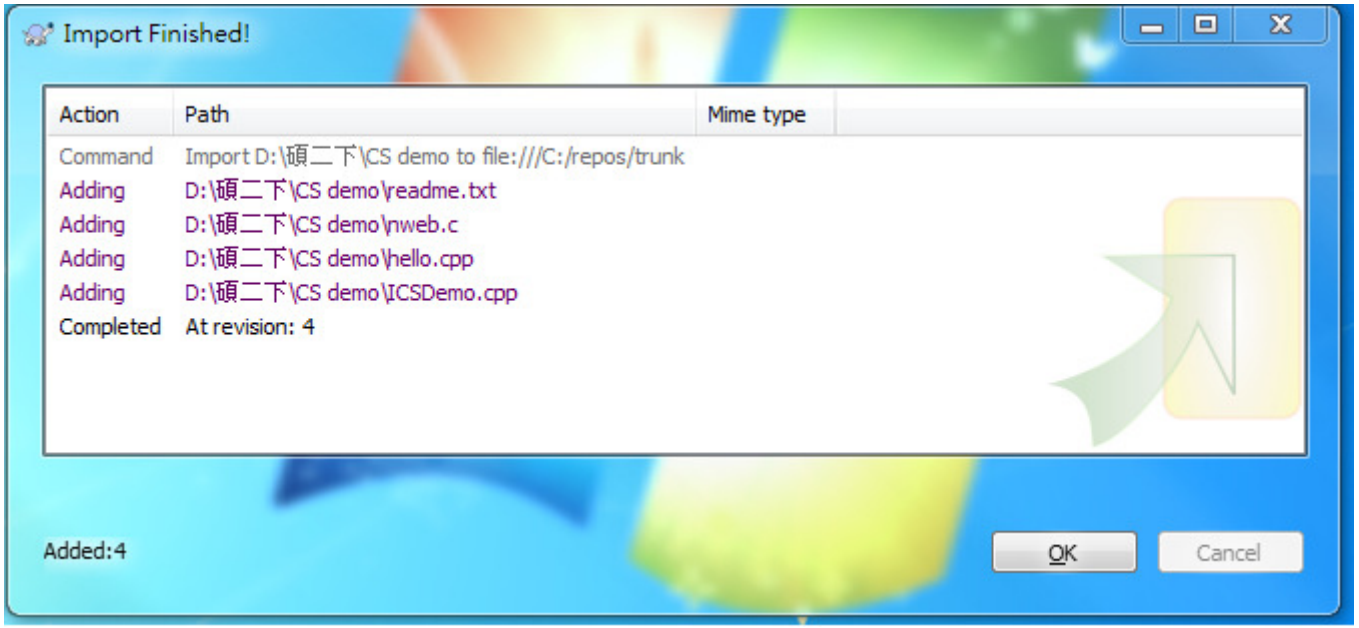
Import (2/4)


D:\碩二下\CS demo - Import - TortoiseSVN
Repository
URL of repository:
file:///C:/repos
Import message
Recent messages
Include ignored files
Enable Auto-Properties
- Repository Browser - TortoiseSVN
URL:
file:///C:/repos/trunk
Revision:
HEAD
file:///C:/repos
branch
tag
trunk
File
Extension
Revision
Author
Size
Date
Lock
OK
Cancel
Help

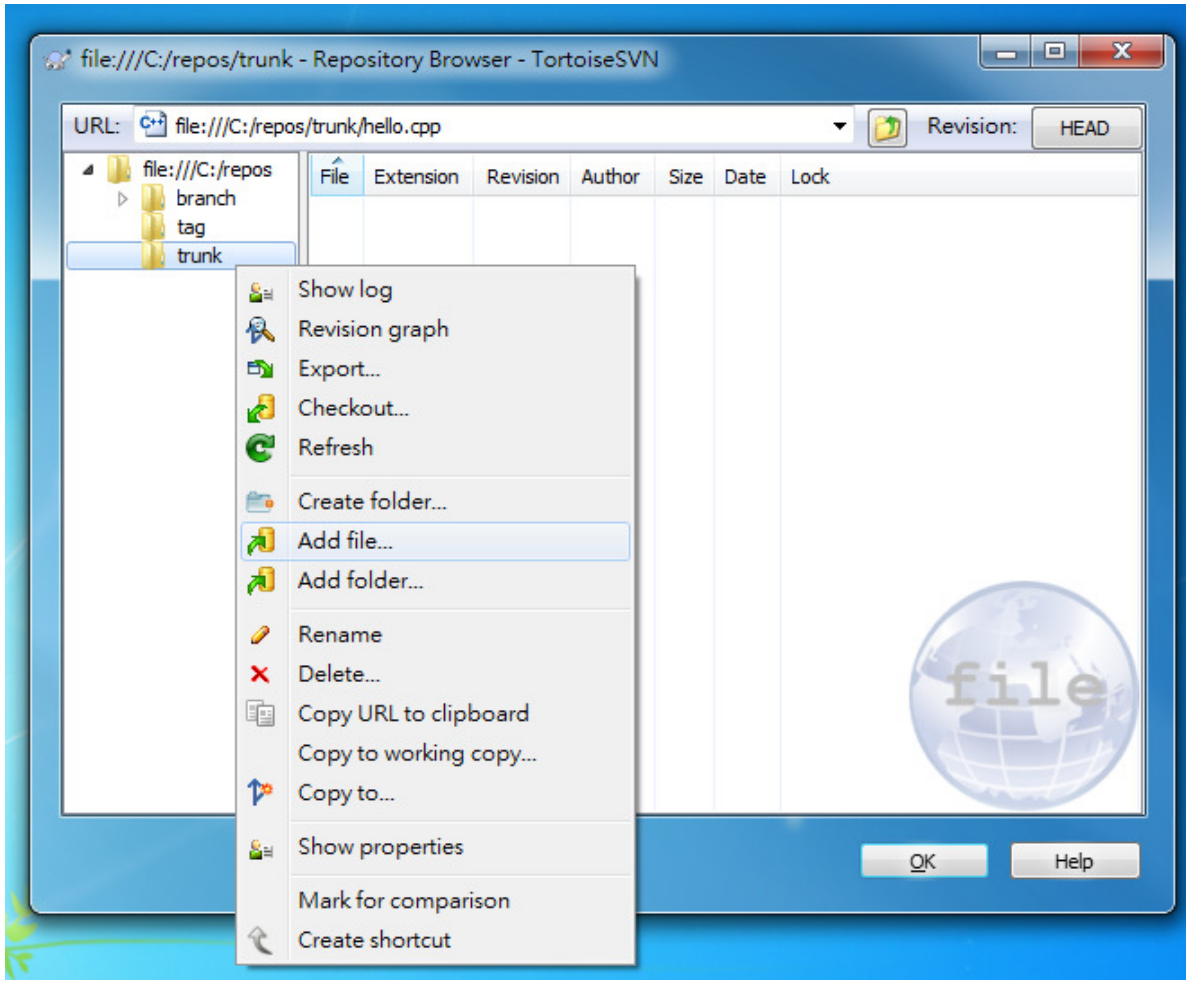
Import (3/4)


D:\碩二下\CS demo - Import - TortoiseSVN
Repository
URL of repository:
file:///C:/repos/trunk
Import message
Recent messages
Include ignored files
Enable Auto-Properties
OK
Cancel
Help

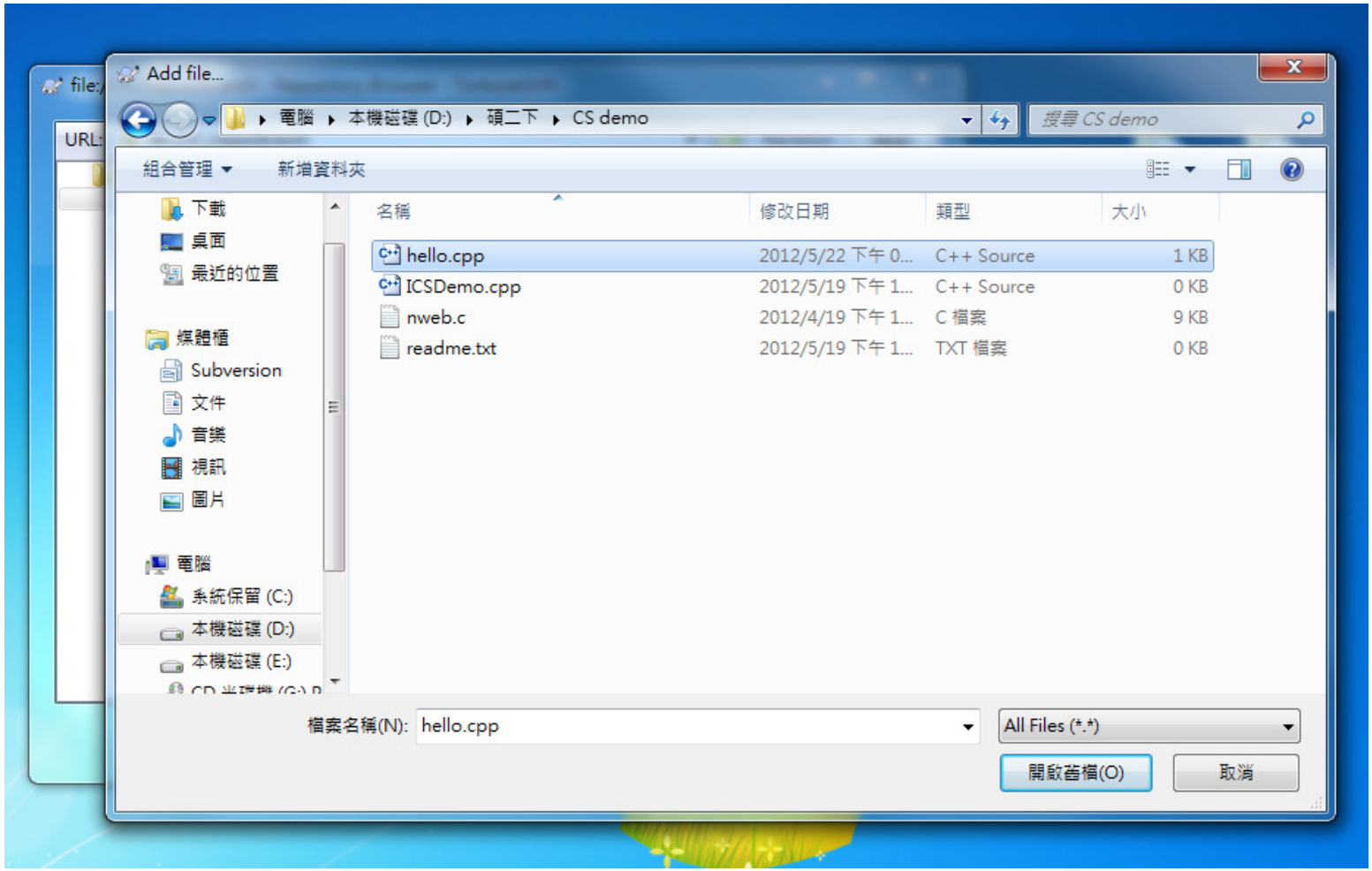
Import (4/4)


Import Finished!
Action
Path
Mime type
Command
Import D:\碩二下\CS demo to file:///C:/repos/trunk
Adding
D:\碩二下\CS demo\readme.txt
Adding
D:\碩二下\CS demo\nweb.c
Adding
D:\碩二下\CS demo\hello.cpp
Adding
D:\碩二下\CS demo\ICSDemo.cpp
Completed
At revision: 4
Added:4
OK
Cancel

Add File (1/2)


file:///C:/repos/trunk - Repository Browser - TortoiseSVN
URL:
file:///C:/repos/trunk/hello.cpp
Revision:
HEAD
file:///C:/repos
branch
tag
trunk
File
Extension
Revision
Author
Size
Date
Lock
Show log
Revision graph
Export...
Checkout...
Refresh
Create folder...
Add file...
Add folder...
Rename
Delete...
Copy URL to clipboard
Copy to working copy...
Copy to...
Show properties
Mark for comparison
Create shortcut
file
OK
Help

Add File (2/2)


Add file...
電腦 ▸ 本機磁碟 (D:) ▸ 碩二下 ▸ CS demo
搜尋 CS demo
組合管理
新增資料夾
下載
桌面
最近的位置
媒體櫃
Subversion
文件
音樂
視訊
圖片
電腦
系統保留 (C:)
本機磁碟 (D:)
本機磁碟 (E:)
名稱
修改日期
類型
大小
hello.cpp 2012/5/22 下午 0... C++ Source 1 KB
ICSDemo.cpp 2012/5/19 下午 1... C++ Source 0 KB
nweb.c 2012/4/19 下午 1... C 檔案 9 KB
readme.txt 2012/5/19 下午 1... TXT 檔案 0 KB
檔案名稱(N): hello.cpp
All Files (*.*)
開啟舊檔(O)
取消

Working Copies

- Come out of the repository.
- An ordinary directory tree on your local system.
- Your own working copy is your own private work area.
- Subversion will never incorporate other people's changes, nor make your own changes available to others, until you explicitly tell it to do so.
- The working administrative directory (.svn) includes information which helps Subversion recognize which files contain unpublished changes, and which files are out-of-date with respect to other's work.

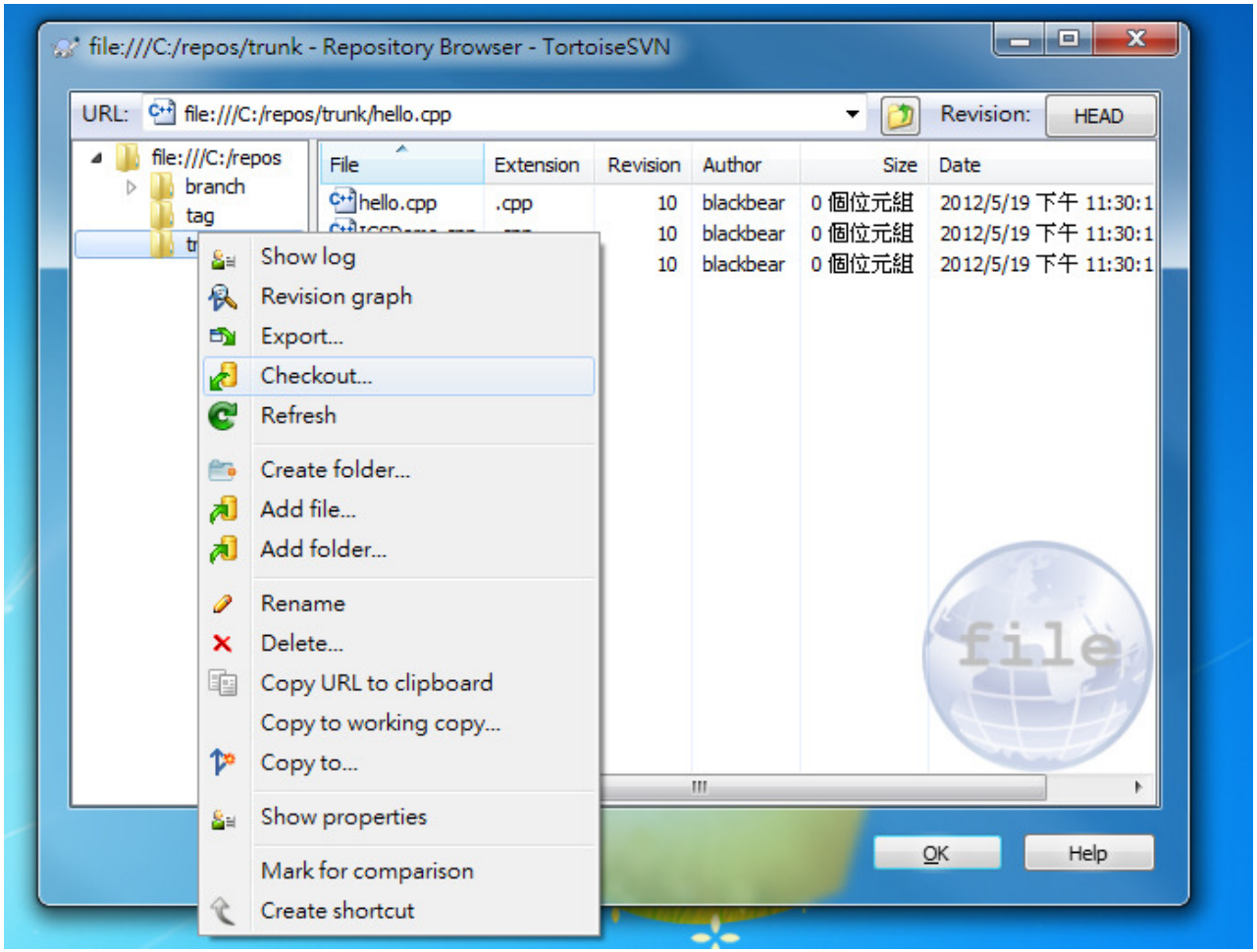
Revisions

- An svn commit operation publishes changes to any number of files and directories as a single atomic transaction.
- Each time the repository accepts a commit, this creates a new state of the filesystem tree, called a revision.
- Each revision is assigned a unique natural number.
- Subversion's revision numbers apply to entire trees, not individual files.

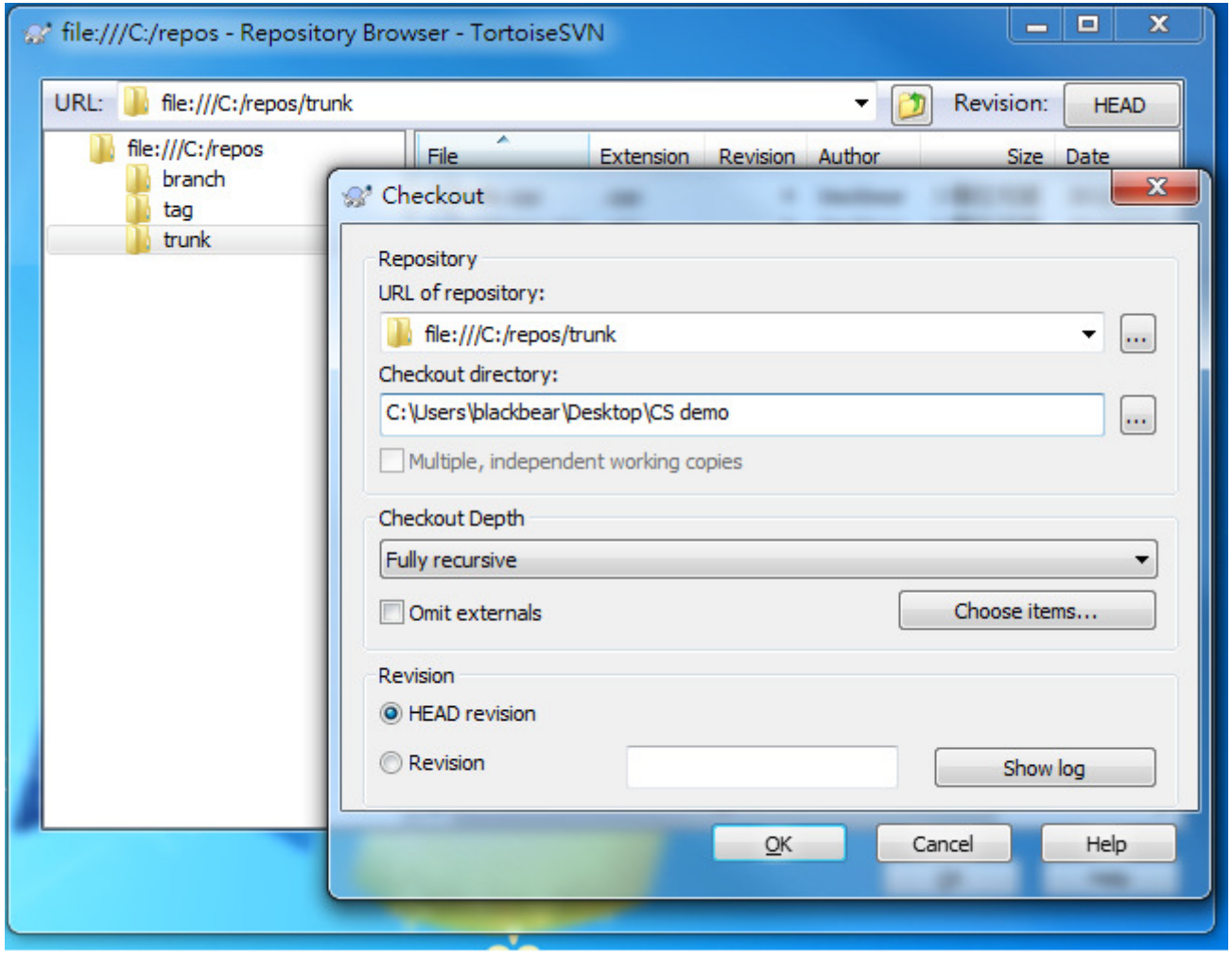
Checkout a Working Copy

- Create a private working copy from remote repository.
- The repository browser also provide the checkout function.
- You can save the local working copy in any directory on your own computer.
- When checking out, you can choose any revision.
  - HEAD revision: the latest revision in the repository.
  - The “Show log” button shows the revision history and help us to find the revision we want.

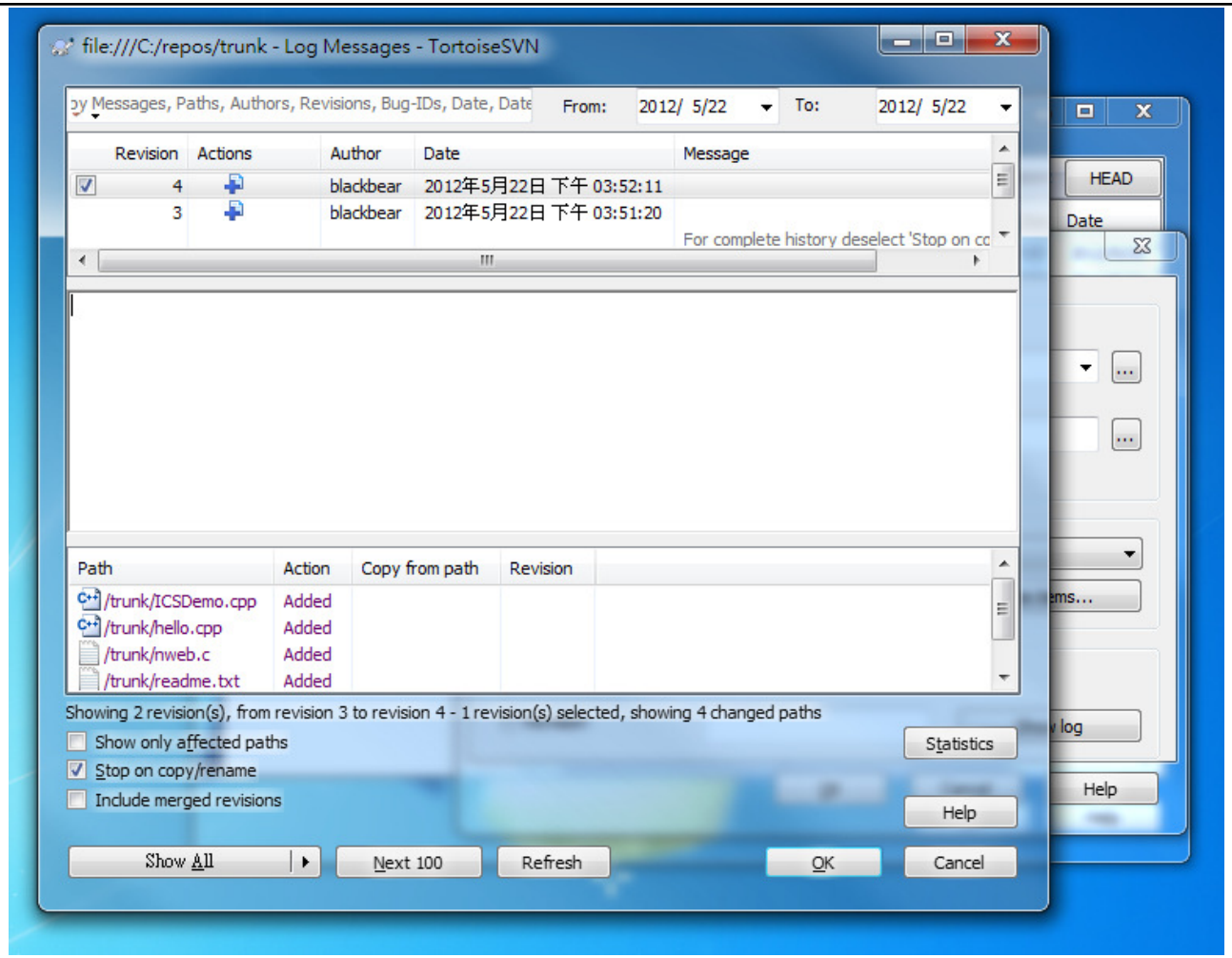
Checkout (1/4)


file:///C:/repos/trunk - Repository Browser - TortoiseSVN
URL:
file:///C:/repos/trunk/hello.cpp
Revision:
HEAD
file:///C:/repos
branch
tag
File
Extension
Revision
Author
Size
Date
hello.cpp
.cpp
10
blackbear
0 個位元組
2012/5/19 下午 11:30:1
Show log
Revision graph
Export...
Checkout...
Refresh
Create folder...
Add file...
Add folder...
Rename
Delete...
Copy URL to clipboard
Copy to working copy...
Copy to...
Show properties
Mark for comparison
Create shortcut
OK
Help

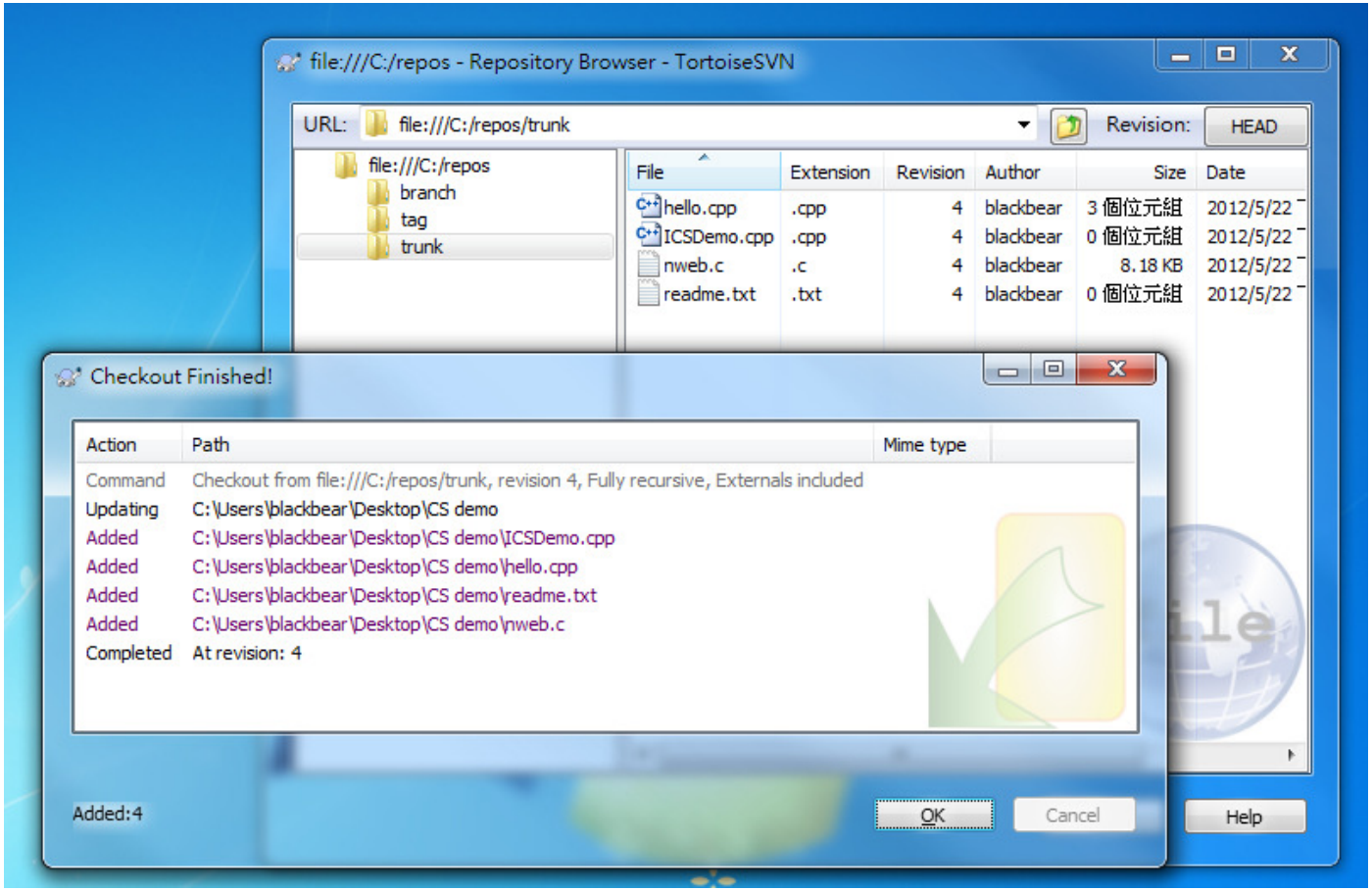
Checkout (2/4)


file:///C:/repos - Repository Browser - TortoiseSVN
URL:
file:///C:/repos/trunk
Revision:
HEAD
file:///C:/repos
branch
tag
trunk
File
Extension
Revision
Author
Size
Date
Checkout
Repository
URL of repository:
file:///C:/repos/trunk
Checkout directory:
C:\Users\blackbear\Desktop\CS demo
Multiple, independent working copies
Checkout Depth
Fully recursive
Omit externals
Choose items...
Revision
HEAD revision
Revision
Show log
OK
Cancel
Help

Checkout (3/4):Show Log



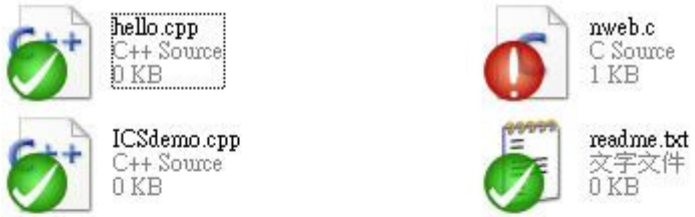
Checkout (4/4):Complete



Make Changes

- Now we can modify the source code in out own local working copy.
  - A modified file has a “!” on it.
- Change to your working copy directory
  - If we add any new file in the working copy, there will be a “?” on it.
  - To add the new file when committing, right-click this file and mark the file as added (a “+” sign will be shown) by selecting “add”.

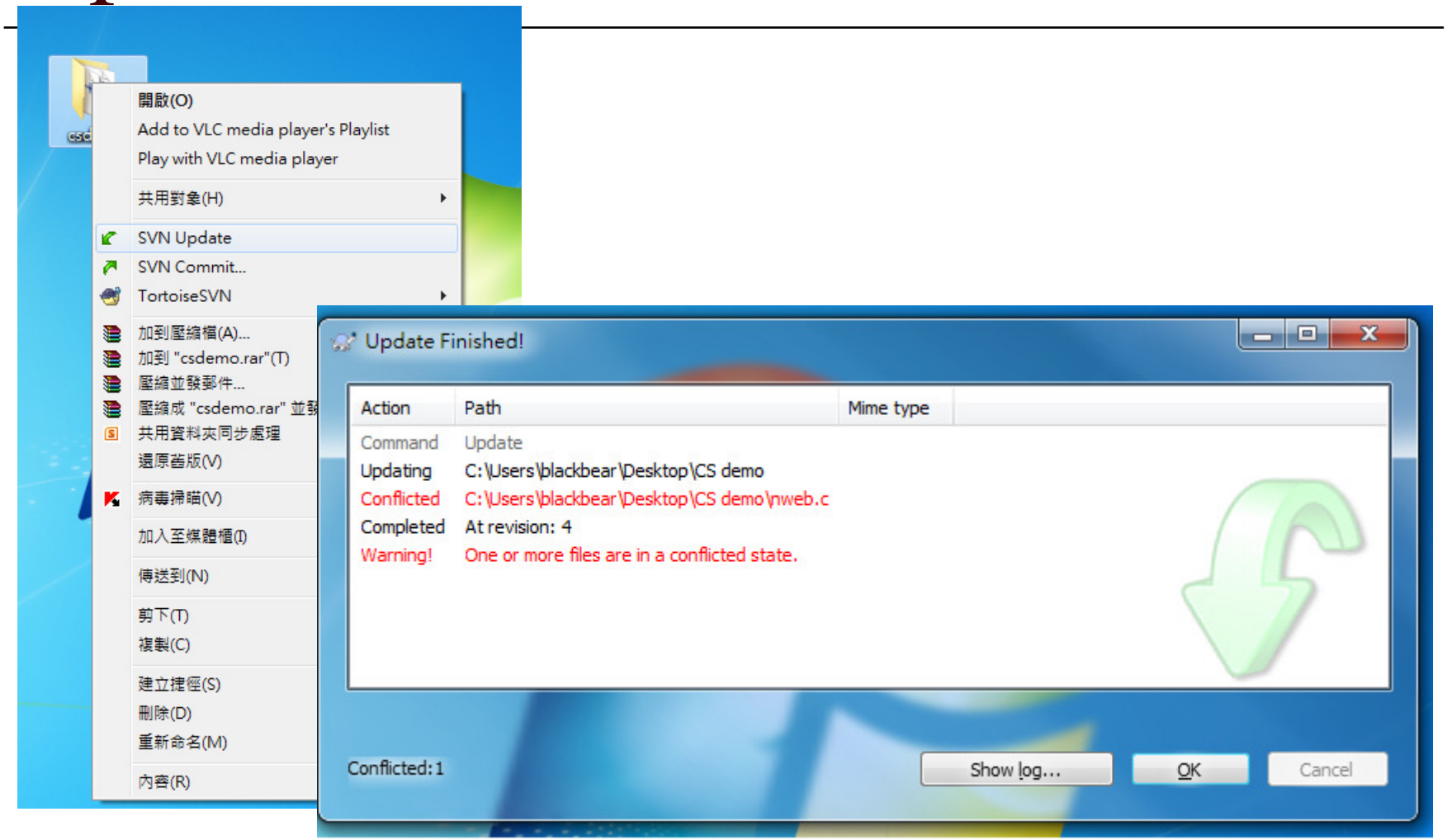

hello.cpp
C++ Source
0 KB
ICSdemo.cpp
C++ Source
0 KB
readme.txt
文字文件
0 KB
nweb.c
C Source
0 KB


hello.cpp
C++ Source
0 KB
nweb.c
C Source
1 KB
ICSdemo.cpp
C++ Source
0 KB
readme.txt
文字文件
0 KB

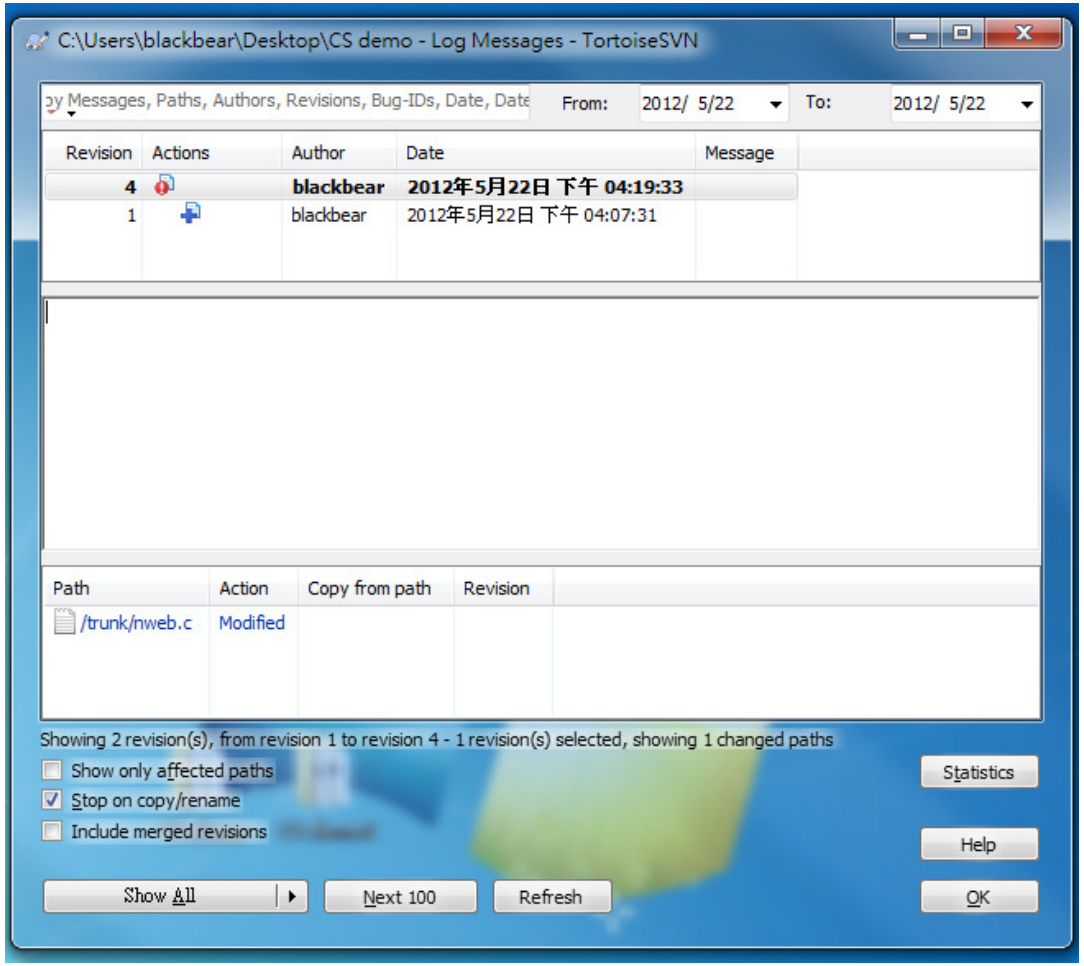
Update Your Working Copy

- You can update to the latest version anytime by right-clicking the project folder and pressing “SVN update”.
  - Note that you can also update your working copy to any revision.
- You can also update to an older version by “update to revision.”
- To prevent any error, we should update our local working copy before committing.

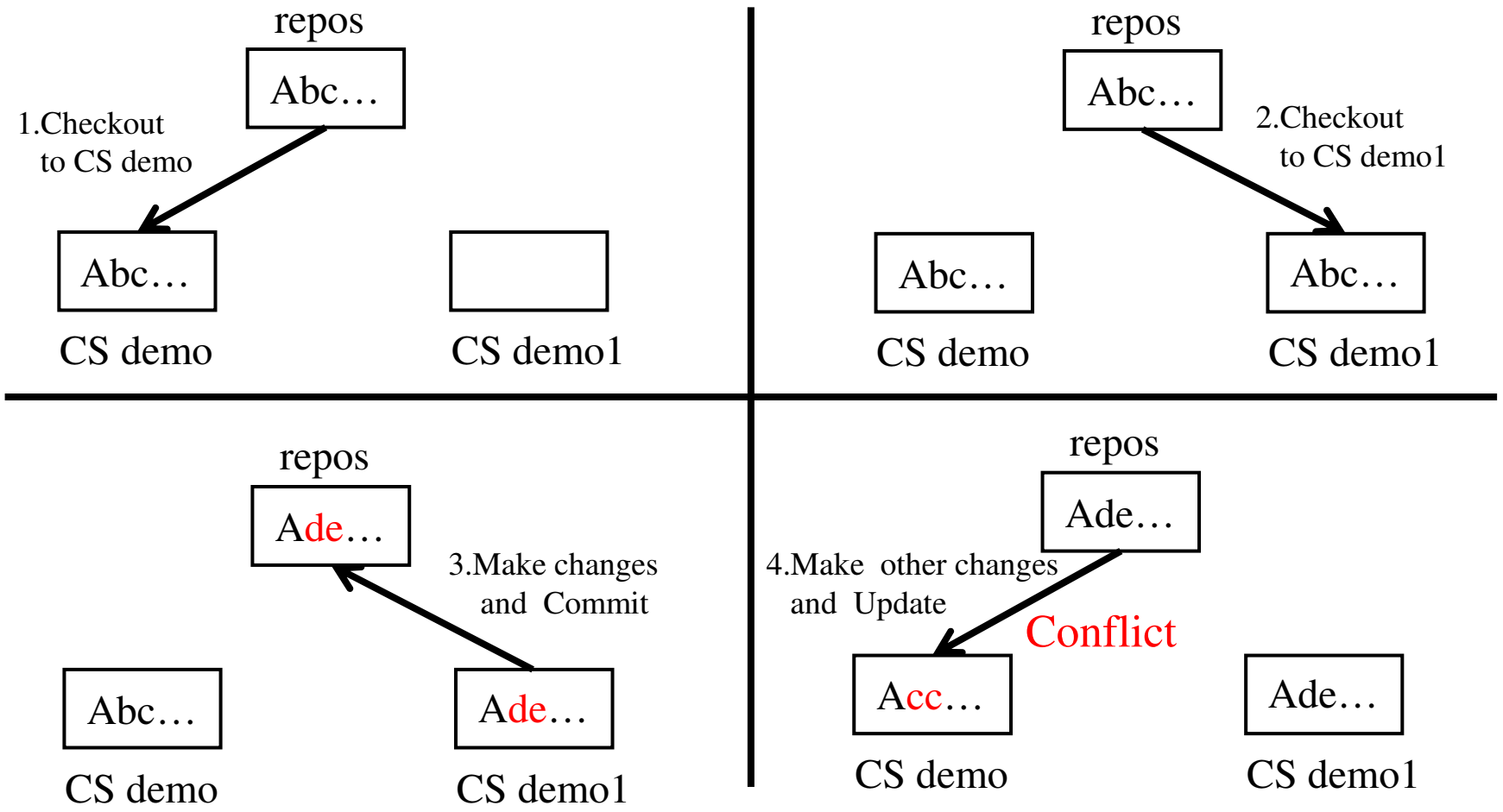
Update


開啟(O)
Add to VLC media player's Playlist
Play with VLC media player
共用對象(H)
SVN Update
SVN Commit...
TortoiseSVN
加到壓縮檔(A)...
加到 "csdemo.rar"(T)
壓縮並發郵件...
共用資料夾同步處理
還原舊版(V)
病毒掃瞄(V)
加入至媒體櫃(I)
傳送到(N)
剪下(T)
複製(C)
建立捷徑(S)
刪除(D)
重新命名(M)
內容(R)
Update Finished!
Action
Path
Mime type
Command
Update
Updating
C:\Users\blackbear\Desktop\CS demo
Conflicted
C:\Users\blackbear\Desktop\CS demo\nweb.c
Completed
At revision: 4
Warning!
One or more files are in a conflicted state.
Conflicted: 1
Show log...
OK
Cancel

Conflict


C:\Users\blackbear\Desktop\CS demo - Log Messages - TortoiseSVN
Messages, Paths, Authors, Revisions, Bug-IDs, Date, Date
From:
2012/ 5/22
To:
2012/ 5/22
Revision
Actions
Author
Date
Message
4
blackbear
2012年5月22日 下午 04:19:33
1
blackbear
2012年5月22日 下午 04:07:31
Path
Action
Copy from path
Revision
/trunk/nweb.c
Modified
Showing 2 revision(s), from revision 1 to revision 4 - 1 revision(s) selected, showing 1 changed paths
Show only affected paths
Stop on copy/rename
Include merged revisions
Statistics
Help
Show All
Next 100
Refresh
OK

Why Conflict?



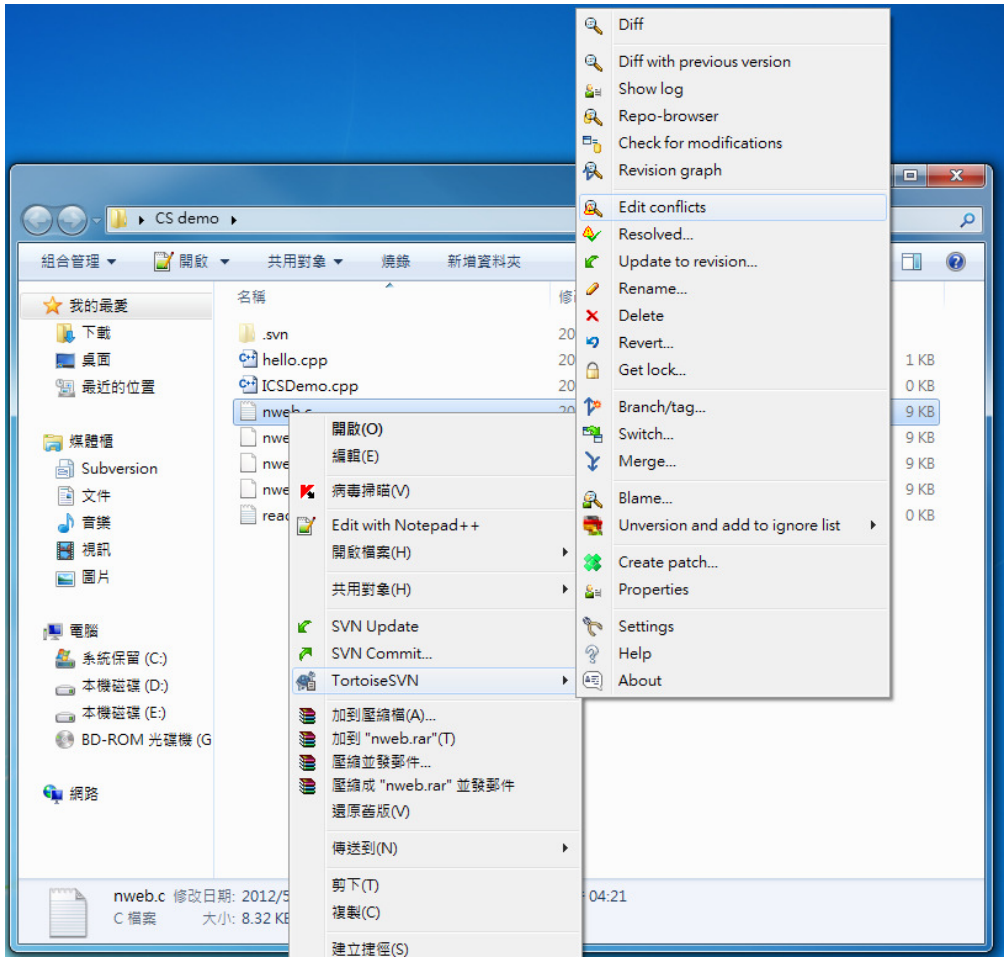
Merge Others' Changes

- After "svn update", you cannot commit if you get a conflict
  - A conflict means that others already commit some changes on files which you just modified.
- Deal with a conflict
  - Merge the conflicted text "by hand".
  - Copy one of the temporary files on top of your working file.
  - Run svn revert filename to throw away all of your local changes.

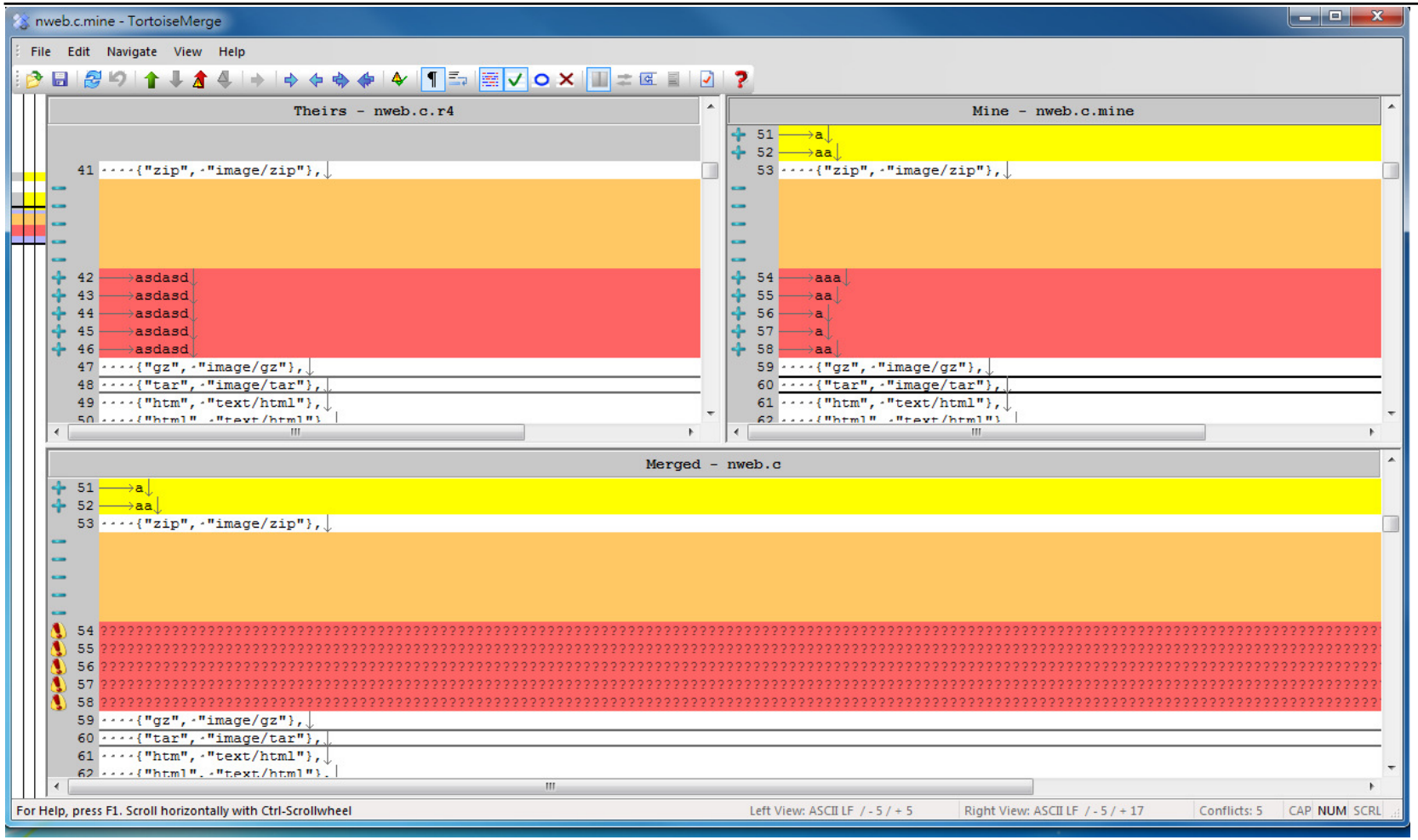
TortoiseMerge

- TortoiseMerge is a tool helping us to resolve the conflict
  - Right-click the conflict file and select “Edit Conflicts”
  - Check the difference between yours and the new version.
  - The upper toolbar provides some solutions to resolve the conflict. We can also modify the file by typing in the “merged” window.
  - Note that “diff” and “diff with previous version” functions are also useful to track the difference between versions

Edit Conflicts



Tortoise Merge



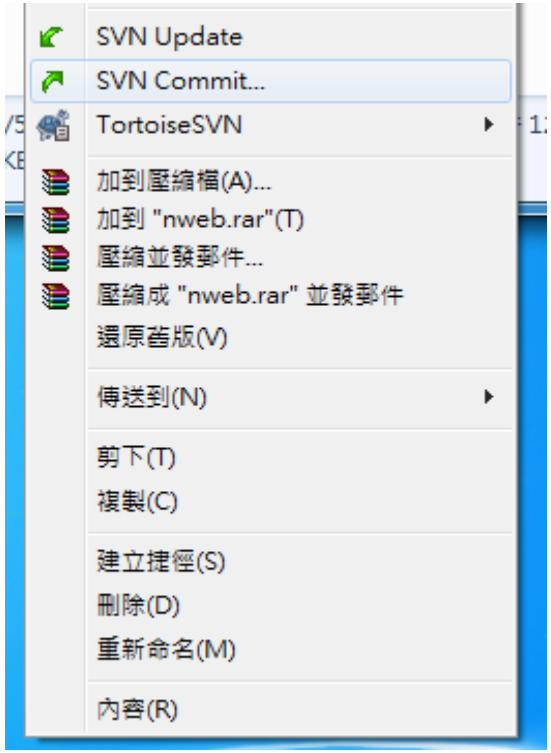
Merging conflicts by hand

- Open the source file via any editor

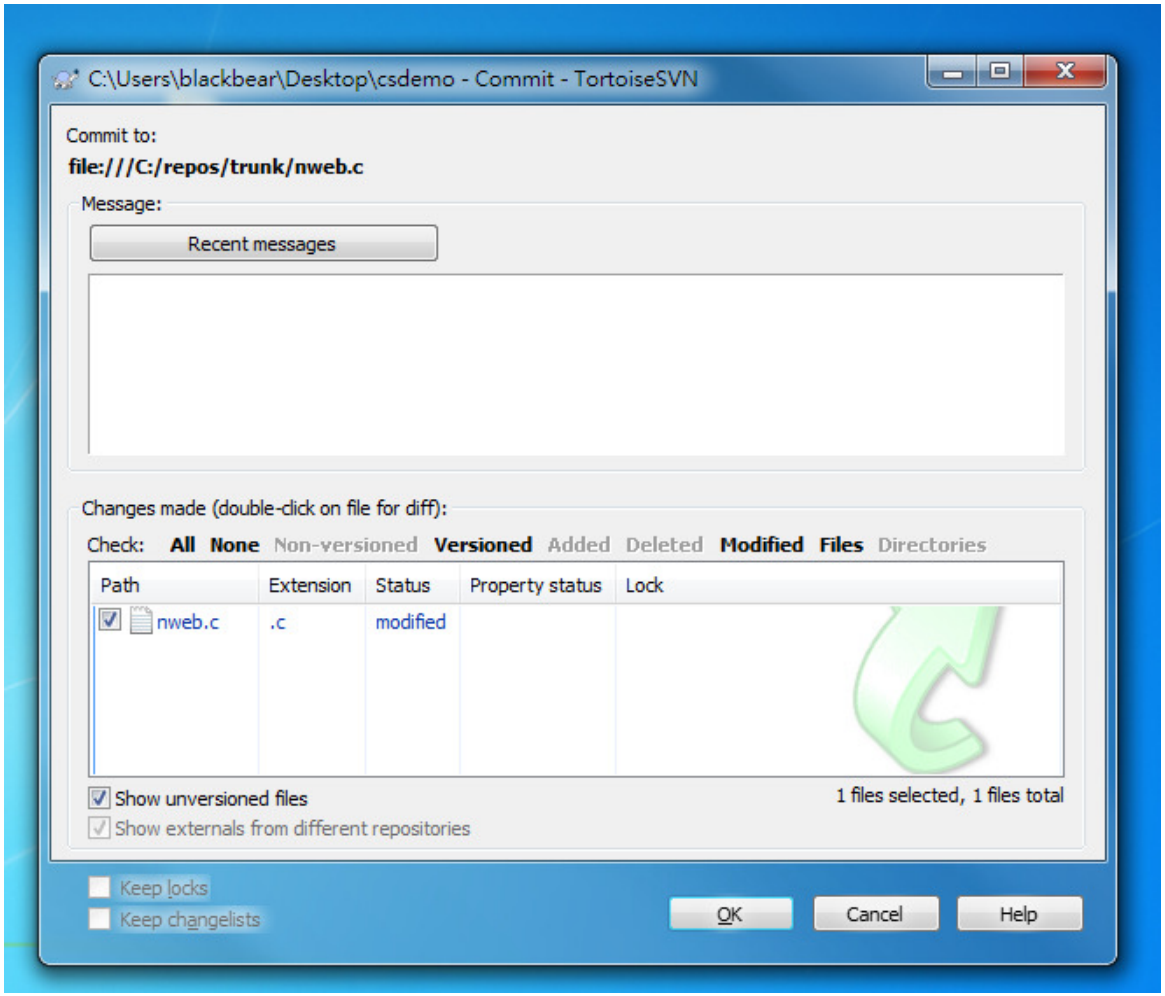
```
44      {"ico", "image/ico"},
45
46      aaa
47      aa
48      a
49      a
50      a
51      a
52      aa
53      {"zip", "image/zip"},
54  <<<<<<< .mine
55      aaa
56      aa
57      a
58      a
59      aa
60  =======
61      asdasd
62      asdasd
63      asdasd
64      asdasd
65      asdasd
66  >>>>>>> .r4
67      {"gz", "image/gz"},
68      {"tar", "image/tar"},
69      {"htm", "text/html"},
70      {"html", "text/html"},
71      {0, 0}
72  };
73
```

Commit your changes

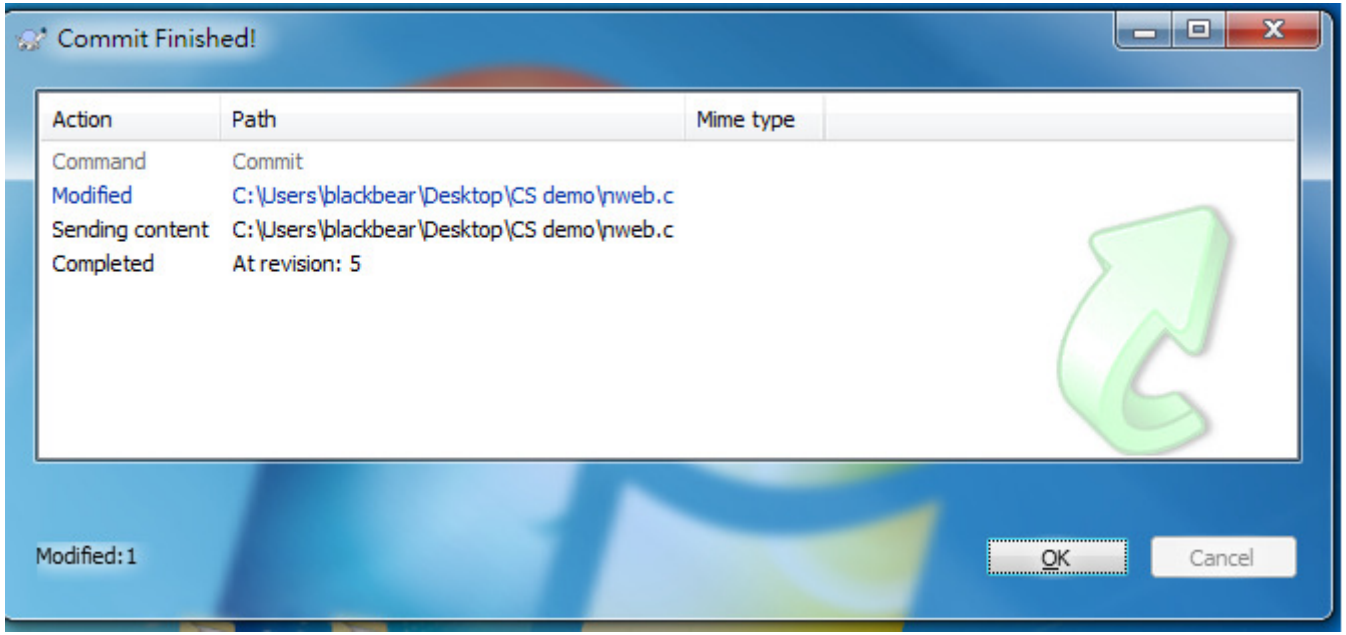
- After resolving all conflicts, now we can commit the modified files.



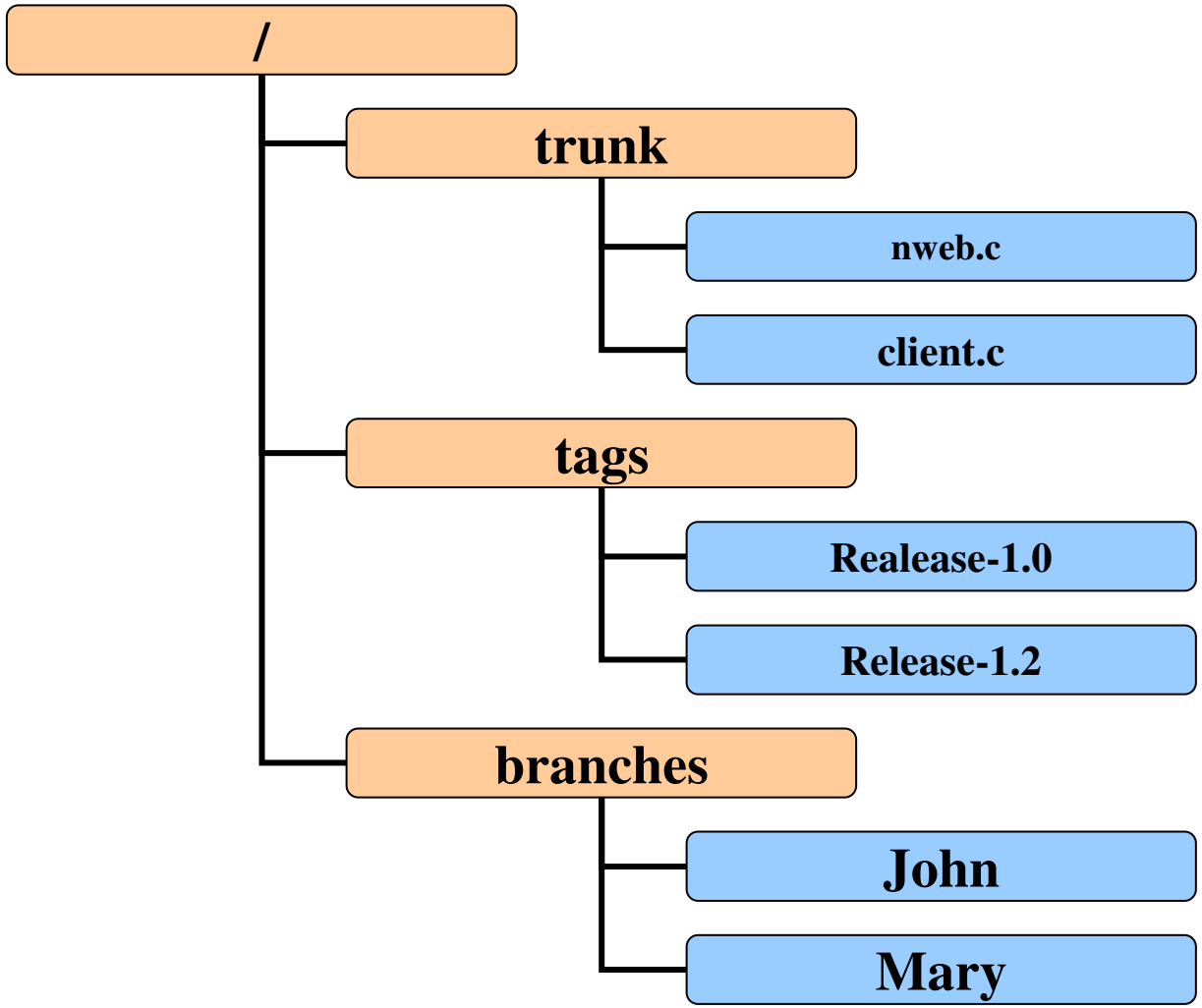
Commit (1/2)


C:\Users\blackbear\Desktop\csdemo - Commit - TortoiseSVN
Commit to:
file:///C:/repos/trunk/nweb.c
Message:
Recent messages
Changes made (double-click on file for diff):
Check: All None Non-versioned Versioned Added Deleted Modified Files Directories
Path
Extension
Status
Property status
Lock
nweb.c
.c
modified
Show unversioned files
Show externals from different repositories
1 files selected, 1 files total
Keep locks
Keep changelists
OK
Cancel
Help

Commit (2/2)


Commit Finished!
Action
Path
Mime type
Command
Commit
Modified
C:\Users\blackbear\Desktop\CS demo\nweb.c
Sending content
C:\Users\blackbear\Desktop\CS demo\nweb.c
Completed
At revision: 5
Modified: 1
OK
Cancel

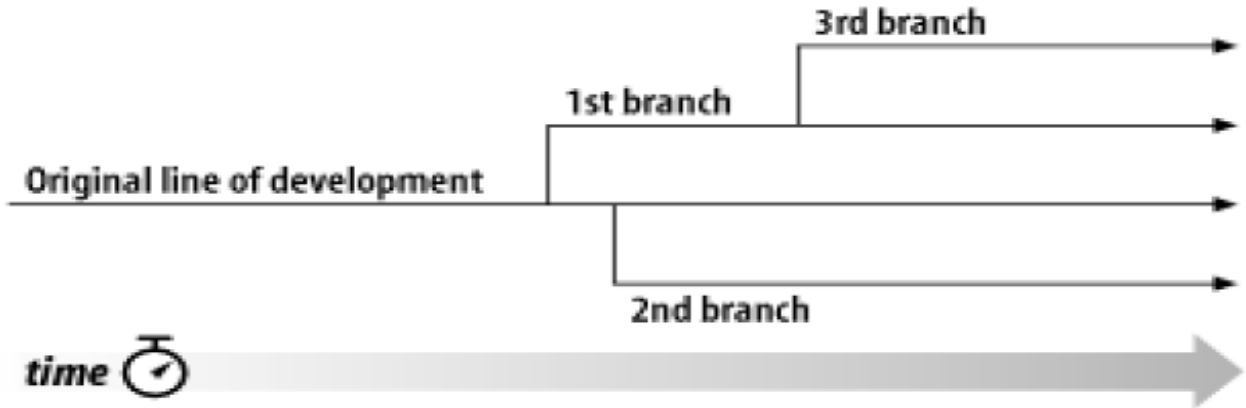
Branching, tagging, and merging



Branching, tagging, and merging

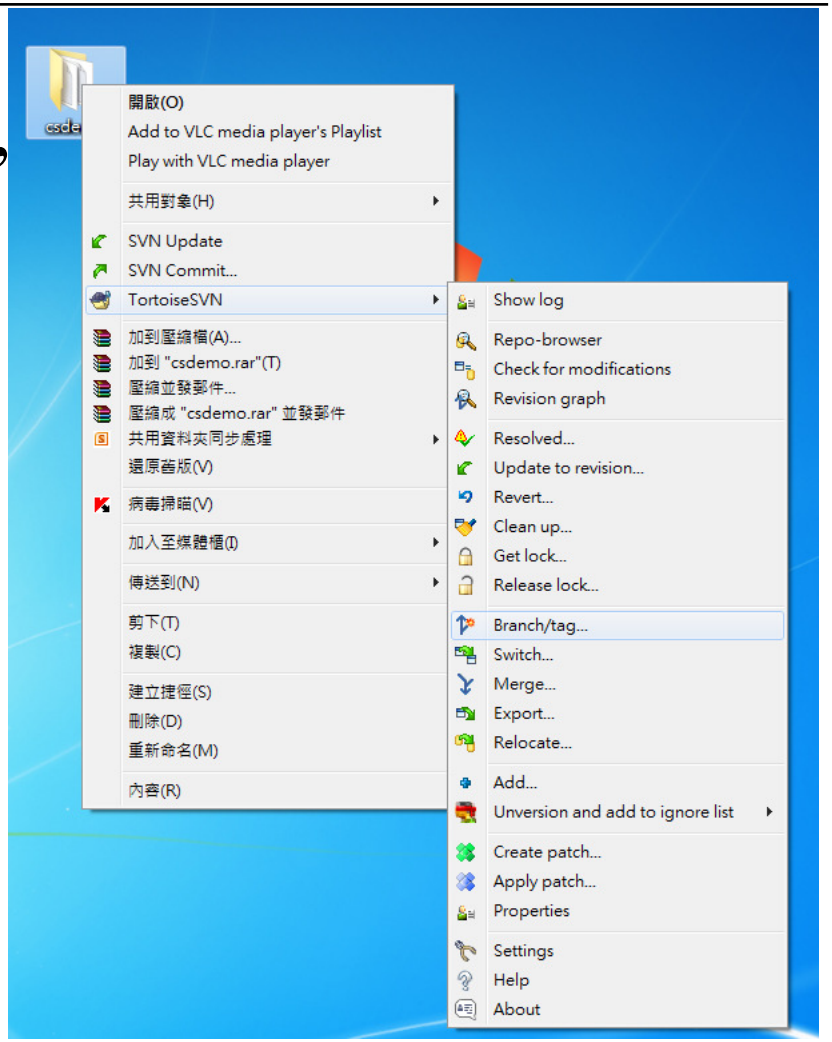
- Trunk: the main line of development is going to take place.
- Branch: a line of development that exists independently of another line, yet still shares a common history if you look far enough back in time.

Figure 4.1. Branches of development

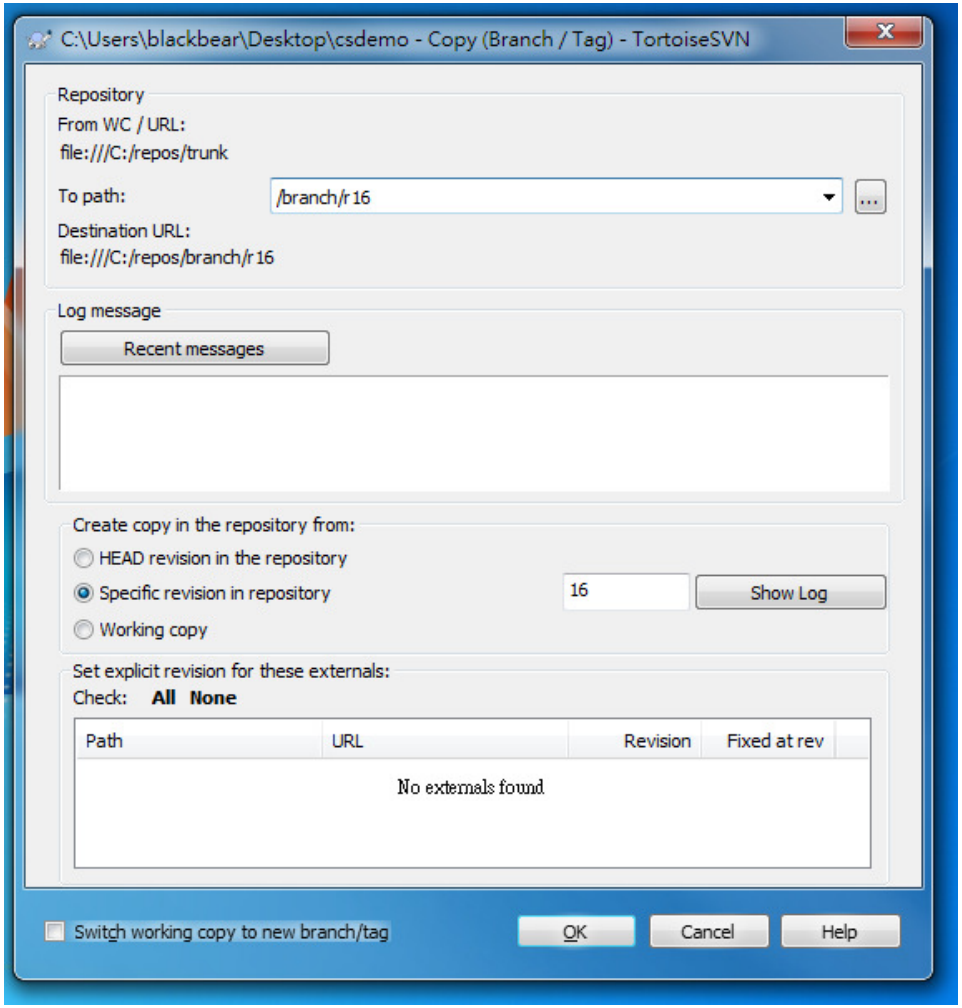


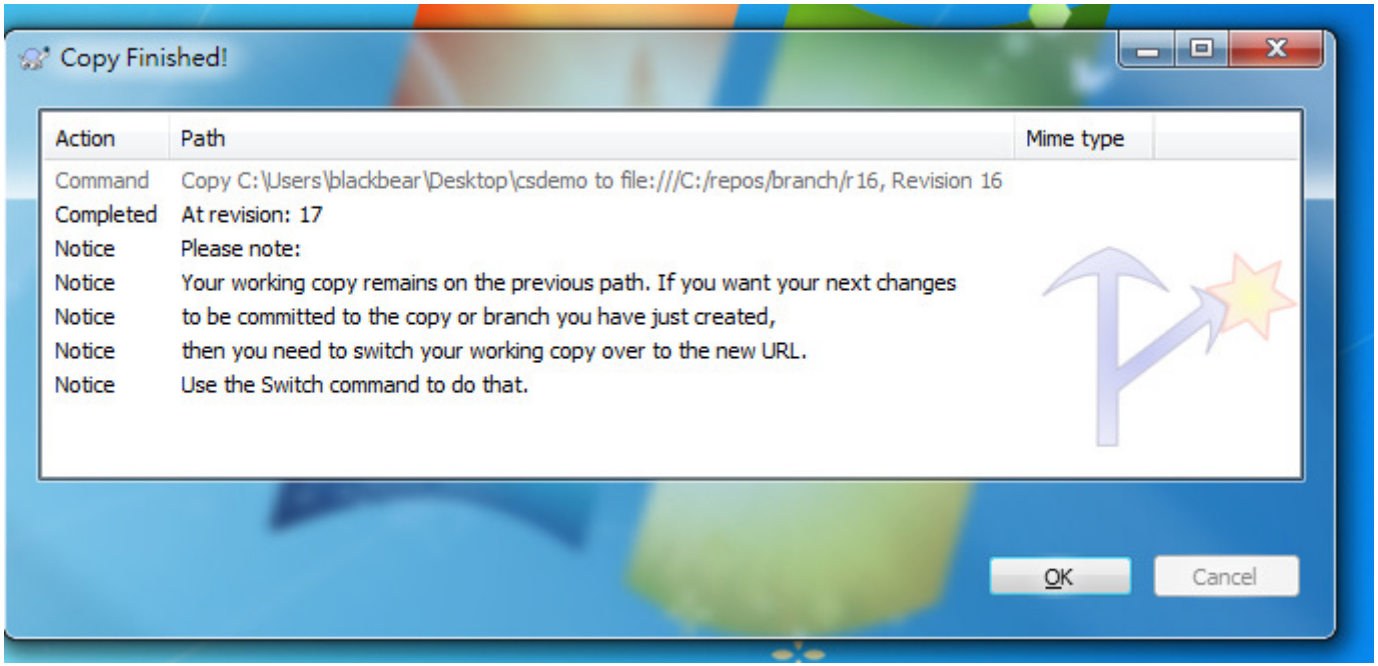
Branching and Tagging

- To create a branch or a tag, select “Branch/tag” option.
- You can specify a revision to create the new branch/tag.



Create a New Branch

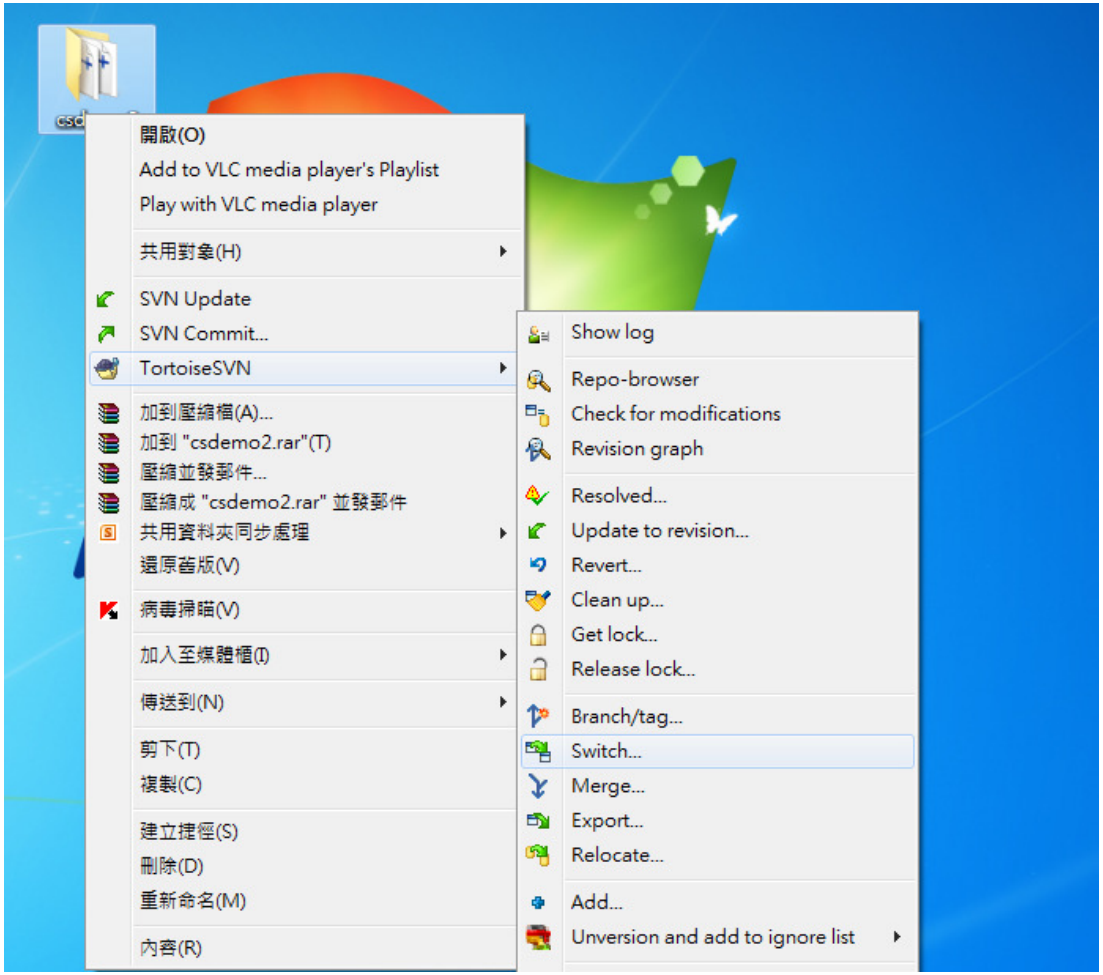



Copy Finished!
Action
Path
Mime type
Command
Copy C:\Users\blackbear\Desktop\csdemo to file:///C:/repos/branch/r16, Revision 16
Completed
At revision: 17
Notice
Please note:
Notice
Your working copy remains on the previous path. If you want your next changes
Notice
to be committed to the copy or branch you have just created,
Notice
then you need to switch your working copy over to the new URL.
Notice
Use the Switch command to do that.
OK
Cancel

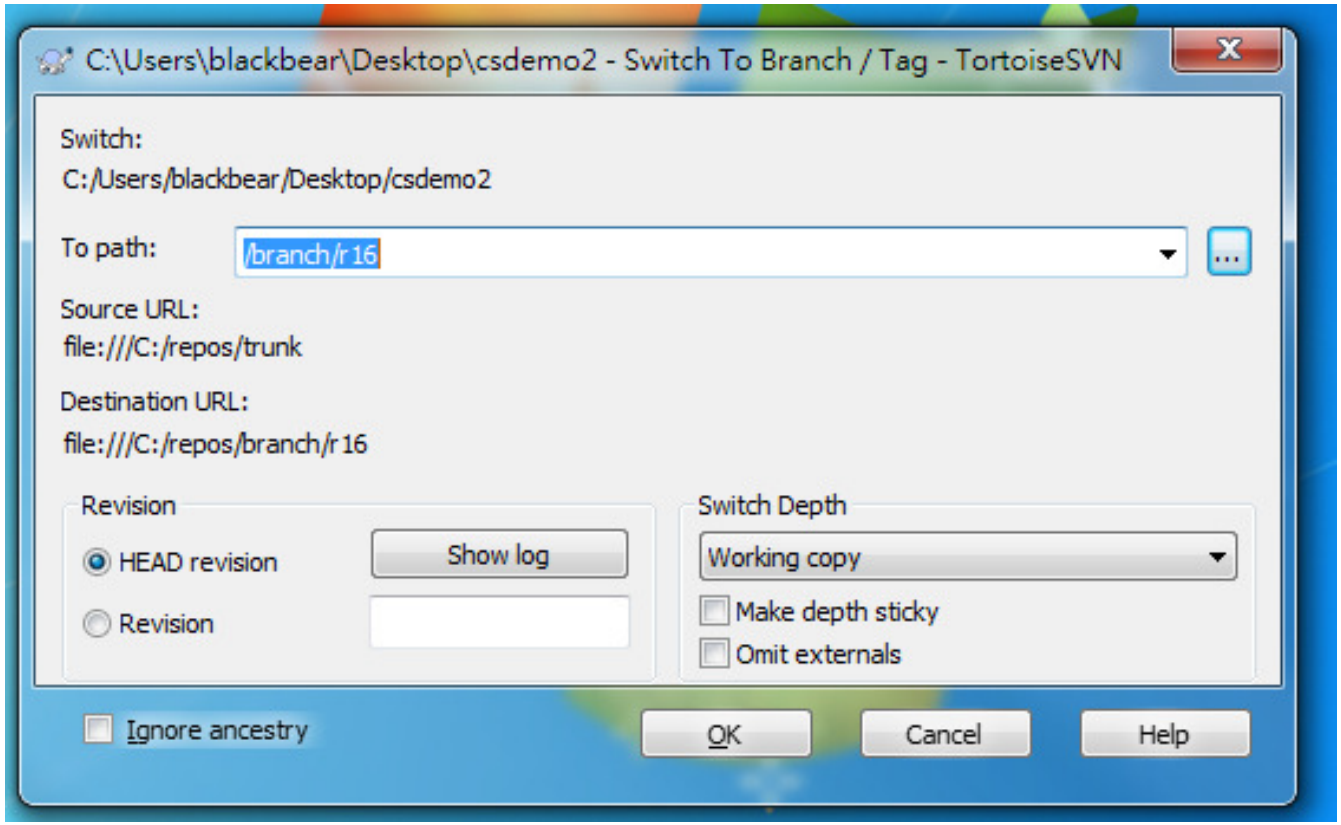
Switching

- After successfully creating a new branch/tag, any local changes will still commit to the original position (trunk).
- To work on a specific branch, we should first switch to the branch.
- Now the further changes will be committed to the branch.

Switch (1/2)


開啟(O)
Add to VLC media player's Playlist
Play with VLC media player
共用對象(H)
SVN Update
SVN Commit...
TortoiseSVN
加到壓縮檔(A)...
加到 "csdemo2.rar"(T)
壓縮並發郵件...
壓縮成 "csdemo2.rar" 並發郵件
共用資料夾同步處理
還原舊版(V)
病毒掃瞄(V)
加入至媒體櫃(I)
傳送到(N)
剪下(T)
複製(C)
建立捷徑(S)
刪除(D)
重新命名(M)
內容(R)
Show log
Repo-browser
Check for modifications
Revision graph
Resolved...
Update to revision...
Revert...
Clean up...
Get lock...
Release lock...
Branch/tag...
Switch...
Merge...
Export...
Relocate...
Add...
Unversion and add to ignore list

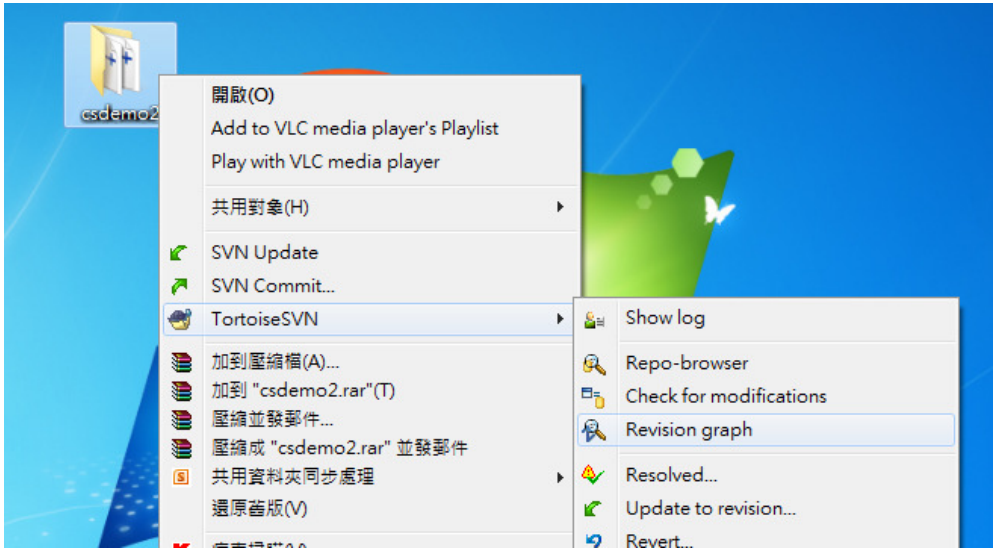
Switch (2/2)

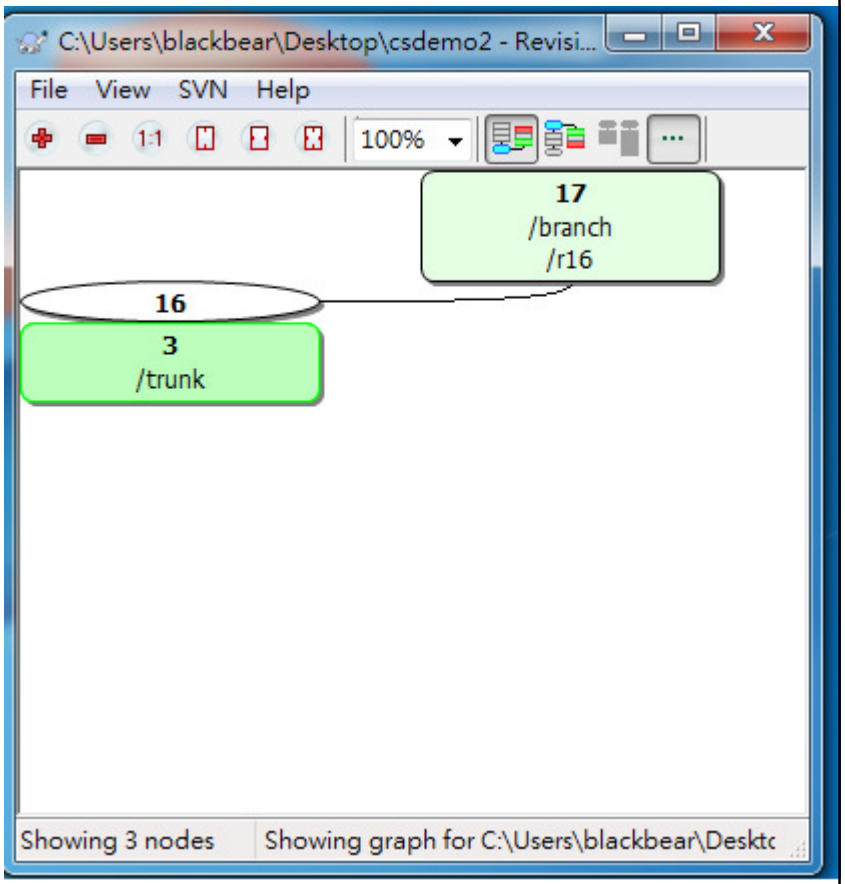

C:\Users\blackbear\Desktop\csdemo2 - Switch To Branch / Tag - TortoiseSVN
Switch:
C:/Users/blackbear/Desktop/csdemo2
To path:
/branch/r16
Source URL:
file:///C:/repos/trunk
Destination URL:
file:///C:/repos/branch/r16
Revision
HEAD revision
Show log
Revision
Switch Depth
Working copy
Make depth sticky
Omit externals
Ignore ancestry
OK
Cancel
Help

Revision Graph (1/2)

- The revision graph shows the revision tree, which presents the version history.
- The number represents revision, all branches/tags will be shown and we can easily see which revision a branch/tag is created from.

Revision Graph (2/2)

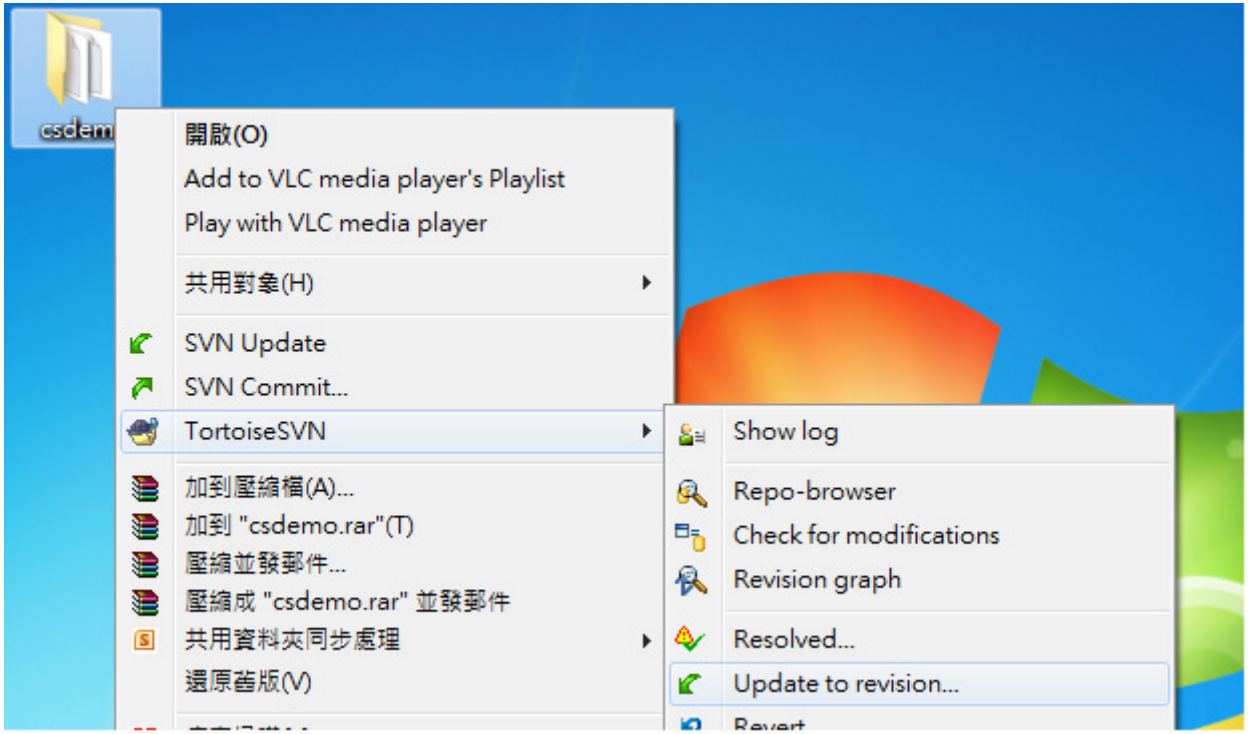




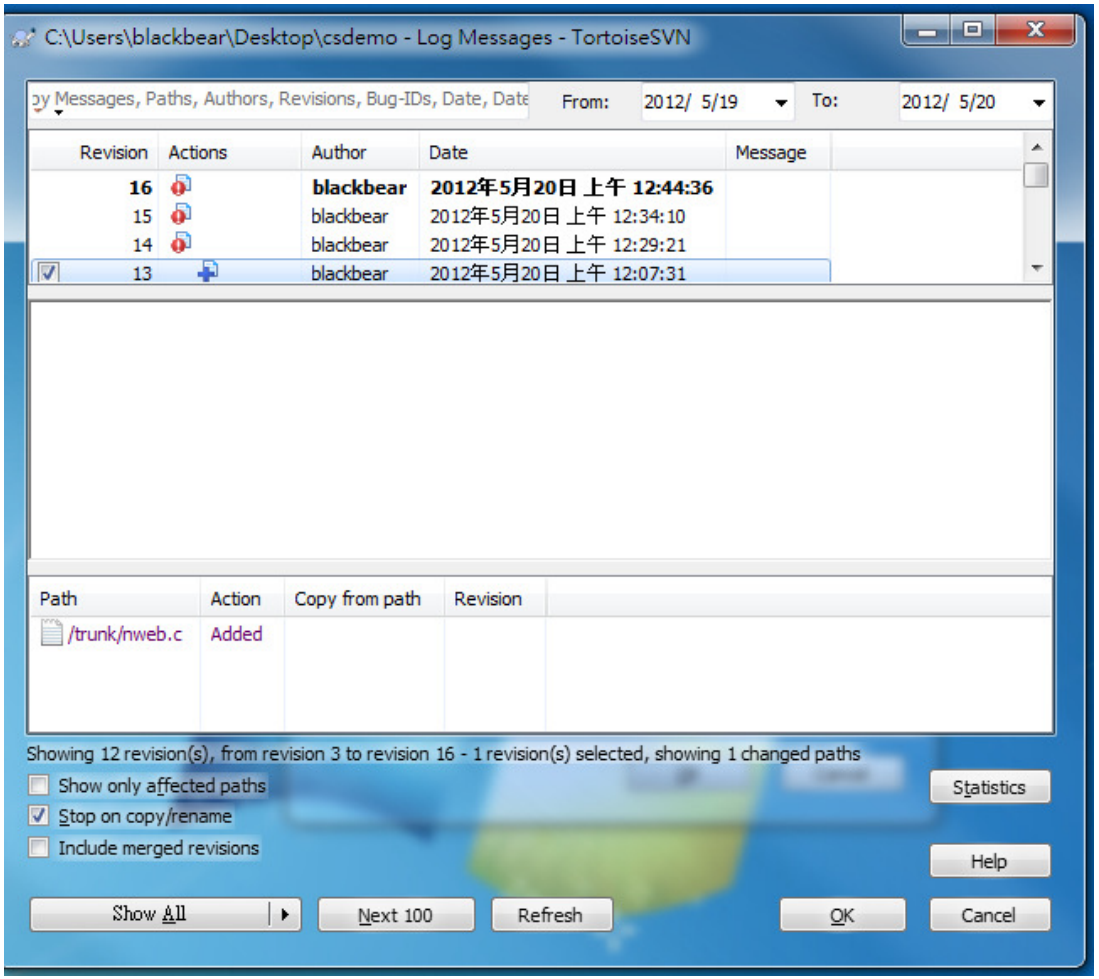
Update To An Old Version

- If we want to revert to an older version in the repository, select “update to revision…”
  - If you are not sure which revision to use, “show log” may help. You can find what changes have done and some comments there.
- Note that another function called “Revert” let us revert to pre-modified version in our local records.

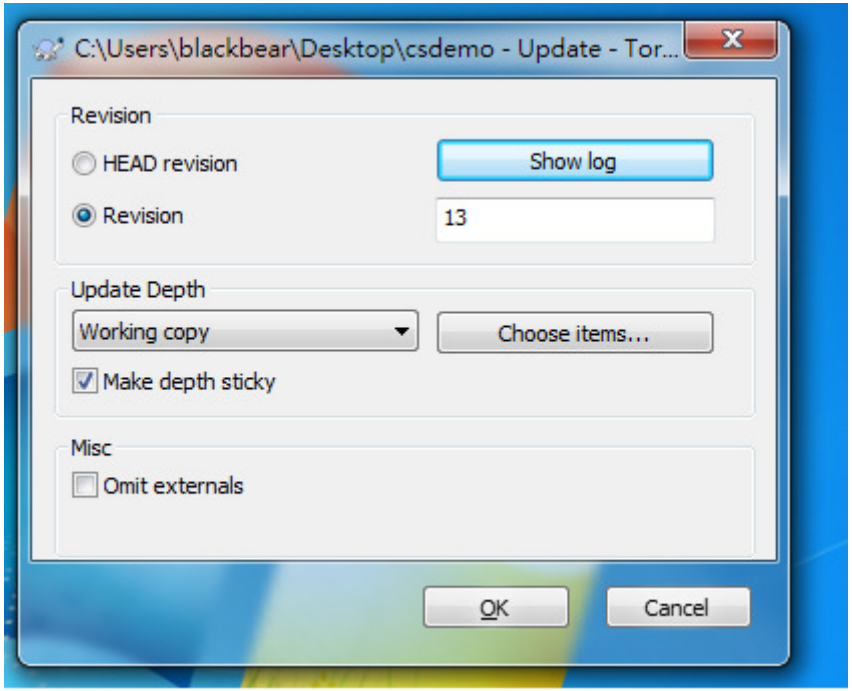
Update To Revision



Log Manager


C:\Users\blackbear\Desktop\csdemo - Log Messages - TortoiseSVN
Messages, Paths, Authors, Revisions, Bug-IDs, Date, Date
From: 2012/ 5/19
To: 2012/ 5/20
Revision
Actions
Author
Date
Message
16 blackbear 2012年5月20日 上午 12:44:36
15 blackbear 2012年5月20日 上午 12:34:10
14 blackbear 2012年5月20日 上午 12:29:21
13 blackbear 2012年5月20日 上午 12:07:31
Path
Action
Copy from path
Revision
/trunk/nweb.c
Added
Showing 12 revision(s), from revision 3 to revision 16 - 1 revision(s) selected, showing 1 changed paths
Show only affected paths
Stop on copy/rename
Include merged revisions
Statistics
Help
Show All
Next 100
Refresh
OK
Cancel

Update to a specific revision



Recommended Reading

- http://www.cs.ubc.ca/~vailen/svn_howto.htm
- http://www.shokhirev.com/nikolai/programs/SVN/svn.html